REPORT RESUMES

ED 012 713 SP 001 241

MEDIA COMPETENCIES FOR TEACHERS, A PROJECT TO IDENTIFY COMPETENCIES NEEDED BY TEACHERS IN THE USE OF THE NEWER MEDIA AND VARIOUS APPROACHES TO ACHIEVING THEM.

BY- MEIERHENRY, W.C.
NEBRASKA UNIV., LINCOLN, TEACHERS COLL.

REPORT NUMBER BR-5-0730 PUB DATE 31 MAR 66
CONTRACT OEC-5-0730-2-12-6
EDRS PRICE MF-$1.00 HC-$9.48 237P.

DESCRIPTORS- AUDIO VIDEO LABORATORIES, AUDIOVISUAL INSTRUCTION, CONSTRUCTED RESPONSE, *LEARNING THEORIES, *MASS MEDIA, MEDIA SPECIALISTS, SYSTEMS ANALYSIS, *TEACHER EDUCATION, *TEACHER QUALIFICATIONS, *TEACHING TECHNIQUES, LINCOLN

THIS REPORT CONTAINS SEVEN PAPERS DEALING WITH COMPETENCIES NEEDED BY TEACHERS IN THE USE OF NEWER MEDIA. THEY ARE--(1) ROBERT HEINICH'S "THE TEACHER IN AN INSTRUCTIONAL SYSTEM," WHICH DEALS WITH SYSTEMS ANALYSIS AND ITS ROLE IN THE TEACHING-LEARNING PROCESS, (2) KENNETH NORBERG'S "THEORETICAL BACKGROUND REQUIRED BY TEACHERS IN THE USE OF NEWER MEDIA," WHICH EXPLORES THE RELATIONSHIP OF A NUMBER OF LEARNING, PERCEPTION, AND COMMUNICATION THEORIES TO MEDIA, (3) VERNON GERLACH'S "SELECTING AN INSTRUCTIONAL MEDIUM, "WHICH REPRESENTS THE APPLICATION OF A RESPONSE-ORIENTED INSTRUCTIONAL SYSTEM IN A SPECIFIC WAY, (4) AND (5) DAVID CURL'S "SELF-INSTRUCTIONAL LABORATORIES FOR TEACHING OPERATIONAL SKILLS" AND JERROLD KEMP'S "IDENTIFICATION OF PRE-SERVICE AND IN-SERVICE TEACHER COMPETENCIES IN THE AREA OF AUDIOVISUAL PRODUCTION TECHNIQUES," BOTH OF WHICH ARE APPLICATIONS OF PRODUCTION AND OPERATIONAL SKILLS IN THE FIELD OF MEDIA, (6) GERALD TORKELSON'S "COMPETENCIES NEEDED BY TEACHERS IN THE USE OF NEWER MEDIA AND VARIOUS APPROACHES TO ACHIEVING THEM," WHICH ADVOCATES THE ESTABLISHMENT OF A NEW LEARNING-BASED TEACHER PREPARATION PROGRAM, AND (7) THE AUTHOR'S "MEDIA COMPETENCIES FOR TEACHERS," WHICH DRAWS ON THE PREVIOUS PAPERS TO PROPOSE A PROGRAM FOR THE DEVELOPMENT OF TEACHER COMPETENCIES. THESE COMPETENCIES ARE (1) UNDERSTANDING OF EDUCATIONAL THEORY, (2) INSTRUCTIONAL SEQUENCES, AND (3) MATERIAL PRODUCTION AND EQUIPMENT OPERATION. (AW)

01

SEP 0 6 1967

R600
U

ED012713

SP 001 241

MEDIA COMPETENCIES FOR TEACHERS

A PROJECT TO IDENTIFY COMPETENCIES NEEDED BY TEACHERS IN THE USE OF THE NEWER MEDIA AND VARIOUS APPROACHES TO ACHIEVING THEM

Project Director
W. C. MEIERHENRY
Assistant Dean and Professor of Education
TEACHERS COLLEGE
UNIVERSITY OF NEBRASKA
Lincoln, Nebraska

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

The project reported on in this publication was conducted pursuant to Contract No. 5-0730-2-12-6, Title VII, Part B, with the Office of Education, U. S. Department of Health, Education, and Welfare.

April 1, 1965 to March 31, 1966

MEDIA COMPETENCIES FOR TEACHERS

A Project to Identify Competencies Needed by Teachers in the Use of the Newer Media and Various Approaches to Achieving Them

Project Director
W. C. Meierhenry
Assistant Dean and Professor of Education
Teachers College
University of Nebraska
Lincoln, Nebraska

The project reported on in this publication was conducted pursuant to Contract No. 5-0730-2-12-6, Title VII, Part B, with the Office of Education, U. S. Department of Health, Education, and Welfare.

April 1, 1965 to March 31, 1966

FOREWARD

The editor is indebted to a large number of people who have helped to make this report possible. First are those persons working with the TEAM Project who first recognized some new dimensions in teacher education and the new conditions imposed upon the teacher as a result of the use of the newer media. Second, there are the individuals serving on the Associated Organizations of Teacher Education who felt strongly that the area of audiovisual competencies for teachers should be reanalyzed.

The editor recognizes with appreciation the Commission on Teacher Education of the Department of Audiovisual Instruction which encouraged the development of a proposal subsequently funded by the U. S. Office of Education. The members of the Commission who also served as members of the *ad hoc* advisory committee are as follows: Clarence O. Bergeson, Associate Professor of Education, The Pennsylvania State University; William Fulton, Professor of Education, University of Oklahoma; Hazel Gibbony, Associate Professor of Education, The Ohio State University; James Hardie, Washington State Supervisor of Audiovisual Services; Robert Heinich, Director, Department of Instructional Technology, University of Southern California; Herbert Hite, Professor of Education, Washington State University; Jerrold Kemp, Professor of Education, Coordinator of Audio-Visual Service Center, San Jose State College; Phil Lange, Professor of Education, Columbia University; Walter J. Mars, Associate Secretary, AACTE, Washington, D. C.; Marie McMahon, Audiovisual Coordinator, Western

Michigan University; James Page, Director, Instructional Materials Center, Michigan State University; Neville Pearson, Associate Professor of Education, University of Minnesota; Hal Riehle, Bureau of Audiovisual Instruction, University of Wisconsin; Gerald Torkelson, Professor of Education, University of Washington; Des Wedberg, Associate Professor of Education, University of Maryland; Paul W. F. Witt, Professor of Education, Columbia University; along with Ann Hyer, Executive Secretary of the Department of Audiovisual Instruction, Washington, D. C. This same group met in a two-day seminar in Washington, D. C., November 1 and 2, 1965, at which time the position papers were presented which form the main body of this report. Included in this group were representatives of elementary and secondary schools as follows: Richard Collier, Director of Staff Development, Montgomery County Public Schools, Rockville, Maryland; Barry Morris, Assistant Superintendent, Fairfax County School Board, Fairfax, Virginia; Thelma F. Davis, first grade teacher, Beaverbrook School, Griffin, Georgia; Wilma McEwen, Director, Audio-Visual Education, Paducah Public Schools, Paducah, Kentucky; and Barbara Worthington Parramore, elementary school teacher, Raleigh, North Carolina, presently on leave of absence. Though not members of the Commission, the following wrote position papers: David H. Curl, Assistant Professor of Education, The University of Chicago; Vernon S. Gerlach, Associate Professor of Education, Arizona State University; and Kenneth Norberg, Professor of Education, Sacramento State College. This group provided excellent feedback to those who prepared position papers enabling them to make appropriate adaptations and changes. Their discussions are reflected also in the organization of this report and in the various comments made by the editor.

A small review group composed of Herbert Hite, Richard Collier, and Walter J. Mars, who were at the Washington meeting, along with David Willis, Dean, School of Education, Portland State College, who was not at the Washington meeting but who is an administrator of a teacher education institution and a professional with great insight into the use of media, met at Palo Alto, California on January 23, 24, 25, and 26, 1966. The intensive and frank discussions of this group led the editor to final decisions about how this report should be assembled and how the various papers should be interrelated. The editor is especially grateful to this small working group.

Special appreciation is given various staff members of the U. S. Office of Education who recognized the need for some attention to this area. Such individuals include Mr. Tom Clemens, whose suggestions greatly strengthened the proposal which was ultimately funded.

Special recognition is due Mrs. Rose Dolan who served as project secretary and who typed the manuscript and Mr. Frank Thompson who edited this final report.

W. C. Meierhenry

TABLE OF CONTENTS

Page

Foreward i

Chapter I, Introduction, W. C. Meierhenry 1

Chapter II, Editor's Comment on Heinich's Paper 5

Robert Heinich, The Teacher In An Instructional System 7

Chapter III, Editor's Comment on Norberg's Paper 31

Kenneth Norberg, Theoretical Background Required By Teachers In The Use of Newer Media 33

Chapter IV, Editor's Comment on Gerlach's Paper 68

Vernon Gerlach, Selecting An Instructional Medium 70

Chapter V, Editor's Comment on Curl's & Kemp's Paper 101

Editor's Comment on Curl's Paper 103

David H. Curl, Self-Instructional Laboratories For Teaching Operational Skills 104

Chapter VI, Editor's Comment on Kemp's Paper 125

Jerrold Kemp, Identification of Pre-Service and In-Service Teacher Competencies In The Area of Audiovisual Production Techniques 127

Chapter VII, Editor's Comment on Torkelson's Paper 167

Gerald Torkelson, Competencies Needed by Teachers In The Use of Newer Media and Various Approaches to Achieving Them 169

Chapter VIII, W. C. Meierhenry, Media Competencies for Teachers 212

Editor's Comment on Media Competencies Needed by Teachers in 1966 223

Chapter IX, Media Competencies Needed by Teachers in 1966 225

CHAPTER I

INTRODUCTION

The outpouring of new technology along with new uses and adaptations of older resources has certainly provided the means for change in the teaching-learning act. Since these potential changes involve teachers, it is evident that there are also implications for the preparation of teachers. The purpose of the teacher competencies project was to examine the implications of the use of the newer media so far as teacher education programs were concerned.

Previous lists of competencies had been developed to guide those responsible for the development of pre-service and in-service programs of teacher education. Such lists included Herbert Hite's at Washington State University in the late 1940's and David Pascoe's in California in the 1950's and at a Lake Okoboji Leadership Training Conference in 1958. It was anticipated by the editor that a new list of competencies would be developed which would eliminate those activities now obsolete, update the list which was still current, and add such new skills, understandings, and attitudes which the newer media seemed to require. The papers which are found in succeeding chapters were commissioned on such a basis and reflect the directions and requirements imposed upon the authors by the editor.

At the seminar held in Washington and the small work conference held at Palo Alto, to which references were made in the Foreward, it became clear that the proposed framework was not appropriate. It was obvious that a teaching-learning model is developing which is learner- and response-oriented and that this same model has widespread implications for the preparation of teachers. A second factor which changed the nature of the original assignment is a rather clear indication that there no longer is a clear line of demarcation between pre-service and in-service education. Because of the rapid changes which are occurring in content, methods, and materials along with newer insights into learning, the best that we can do in the formal teacher education program on campus is to present what is known currently. This means that the formal program must change almost daily in response to what is being discovered and applied. A number of the academic areas, such as the sciences and mathematics, have experienced such changes, and the rapidity of these newer developments is now being felt in teacher education. The schools where the teachers are employed now have responsibility for picking up the staff at whatever point they may be and assisting them to become current. Thus, what was in the formal teacher education program one, two, or three semesters ago now becomes an essential part of the education of teachers who are in the classrooms. Thus, both institutions, those of higher education along with the elementary and secondary schools, have a responsibility for assisting teachers to understand and apply what is known about teaching and learning at any given time. Thus, this report does not give specific attention to pre-service or in-service training but suggests rather that whichever institution the person is in at the moment has the responsibility for keeping understandings, skills, and attitudes current.

Thus, although the position papers were written from a somewhat different point of view, they fit together almost miraculously as a result of the excellent analysis of teacher needs which each of the authors made. It is necessary to read the chapters in the sequence in which they are placed. The editor has attempted, through an introductory statement before each chapter, to make clear how they fit together into a meaningful whole so far as a program of teacher education for the use of the newer media is concerned.

The first paper by Heinich deals with the systems approach. The editor feels that the systems idea represents a new, powerful tool to use in the analysis of such a process as that of teaching-learning. There follows next the chapter by Norberg on theory. A number of learning, perception, and communication theories are explored as they relate to media. As Norberg points out, almost all theories have some implications for media, but he makes clear that the most significant current theories are learner- and response-oriented.

Gerlach's paper is placed next since it represents the application of a response-oriented instructional system in a specific way. What Gerlach does is to make explicit the major current learning theory which Norberg discusses. Curl's and Kemp's papers are applications of production and operational skills in the field of media as suggested by Gerlach. The final paper is the one by Torkelson which proposes a bold, new approach to all of teacher education including media and which reassembles the bits and pieces into a total program.

Thus, the whole report needs to be studied from the perspective of the learner and the way he is expected to respond when he has, in fact, learned what is expected of him. It is suggested that the objective is the same whether it is the teacher dealing with a student, a teacher being taught while in the formal program, or as a practitioner. It is not possible, therefore, to make decisions about what media should be used and thus what competency should be suggested until it is known how the teacher should behave as a learner. Those who wish to have specific competencies as stated in verbal form can find them in each of the chapters. The most significant contribution which this report will make, in the opinion of the editor, is to provide a framework and basis for a new and exciting approach to teaching and learning at all levels and thus a new way to look at teacher education itself.

W. C. M.

CHAPTER II

EDITOR'S COMMENT ON HEINICH'S PAPER

Heinich's paper is a forthright and imaginative paper which deals with the new area of systems analysis and process. Because the paper is somewhat speculative, the reader will find some inconsistencies and points which seem to be illogical.

There are a number of ways of viewing the systems concept. The reader might wish to look at some discussion of the systems point of view in the May, 1965 issue of Audiovisual Instruction. In addition, papers presented at a conference held at Syracuse University in April, 1964, soon to be published, should be studied. The Systems Development Corporation of Santa Monica, California has also given considerable attention to systems developments, and papers prepared by members of that staff should be investigated.

Many people would start with the learner rather than with the curriculum as Heinich appears to do. The concept of feedback also figures prominently in most approaches to systems development. The purpose of feedback is to enable the producer of the learning sequence to improve and validate it.

The concept of the mediated teacher, which Heinich deals with in considerable detail, is not necessarily a part of the systems approach. What the editor feels is a part of the systems approach is a careful analysis of what the response should be and then decisions, arbitrarily made, as to the best way of producing this response followed by empirical testing along with feedback to produce the desired behavior. Thus, the decision as to whether the teacher should be mediated or live can be made only as a result of tryout in a learning situation.

THE TEACHER IN AN INSTRUCTIONAL SYSTEM

Robert Heinich*

> "Moreover, decisions about how to utilize ITV in the classroom cannot be forced upon the teacher by fiat. Unless we wish to scrap completely the notion that the teacher is, in her classroom, an autonomous professional who can be trusted to make judgments about the needs and capabilities of her class, we must allow her to decide at what times and in what ways to utilize the entire armamentum of devices and materials she has at her disposal, television included. It is the administrator's responsibility to make the equipment available so that it can be used well; it is the teacher's responsibility to decide what use to make of it."[1]

> "Materials were more malleable than people: they could be changed and changed and changed again at a small loss; once perfected, they could be reproduced and distributed anywhere and anytime in whatever quantities were needed. The products of technology, they could be designed to illuminate scientific phenomena, and would keep this integrity in any school in the country. The scientists' concern was not what teachers might do with these materials, but what the use of such materials might do to students studying modern physical science."[2]

> "And here is the art of system design: to find those problems of the parts, the study of which enables us best to think most adequately about the whole."[3]

I. Introduction

There are many definitions of system. Systems design experts in the military, electrical engineering, and data processing, to name a few, would differ in certain respects if asked for definitions. Then, lively arguments would go on as experts within each field debated the seemingly simple request for a definition.

---

*Department of Instructional Technology, University of Southern California, Los Angeles, California

For the purposes of this paper, two relatively short definitions will be helpful.

> "1. A system is the structure or organization of an orderly whole, clearly showing the interrelationships of the parts to each other and to the whole itself.[4]
>
> "2. An operational system synthesizes and interrelates the components of a process within a conceptual framework, insuring continuous, orderly, and effective progress toward a stated goal."[5]

The first of these two similar definitions is the older. The second contains a key phrase, "conceptual framework," which I will refer to later.

The system dealt with in this paper is the process of instruction,* which is really a sub-system of the system called education. To help eliminate confusion over the problem of vocabulary we shall apply this general rule: the term _system_ may be used to designate the largest integral organizational _gestalt_ under consideration, even though it may be only a part of an ultimately larger whole. Once the largest _gestalt_ under consideration is identified, then components or parts are _sub-systems_. For example, since in this paper the instructional process is the system, programed instruction is referred to as a sub-system. I deliberately chose programed instruction as an example because programers and behavioral psychologists refer to it as a system. This is appropriate when programed instruction is under consideration by itself, constituting the largest whole being dealt with. It also contains certain adaptive and control features which make it more tightly knit than others. However, programing becomes a sub-system, as does television, when the whole is the instructional process outlined in this paper.

---

*For purposes of this paper _instruction_ is generically defined to include any specifiable means of guiding students through a series of events resulting in a change of behavior through learning.

II. Conflict of the Parts

A system of instruction obviously exists. Children enter school, learn, and graduate within a certain conceptual framework. A systems analysis would reveal many inadequacies in this system but the concern of instructional technology, and of this paper, centers around the interrelationships between certain sub-systems and a need to change the conceptual framework within which the sub-systems function.

A fundamental cause of system redesign is the development of sufficient energy within a sub-system to force a new analysis-synthesis sequence, resulting in a change in the conceptual framework of the system. Instructional technology asserts that sufficient energy has been generated in that sub-system it regards as its particular domain--the mediation of instruction--to require a redesign of the conceptual framework. Instruction has "problems of the parts" which demand a rethinking of the whole.

The main problem is illustrated by two quotations on page seven. Guba apparently takes the traditional position that the classroom teacher must be the sole decision-maker in the classroom. Marsh, on the other hand, believes that certain materials of instruction would function best without the constant, controlling hand of the classroom teacher. Later on in his account of the efforts of the Physical Science Study Committee (PSSC), he concedes that the tradition of classroom teacher as decision-maker sharply curtailed the potential of the materials. I submit that the driving force behind the rationale of this conference is the confrontation of these two points of view.

At this point a brief look at aspects of the historical background of the problem is essential.

III. The Teacher and "Aids" to Instruction[6]

Instructional technology's awareness of and interest in the systems approach derives from two mainstreams. One centers around the logistical support problems inherent in media programs, problems which require a more systematic treatment than is now the case. Factors such as design of buildings and equipment and problems of distribution and display are illustrative of that side of systems concern.

However, this presentation deals with the other mainstream, which is the relationship between mediated and classroom instruction, between media and the classroom teacher, a relationship changing because of the changing nature of media.

Traditionally, audiovisual materials have been considered solely as "aids" to instruction. The literature of the field bears ample testimony to the basic position that the goal of media is to "help" the classroom teacher.

During World War II great reliance was placed on audiovisual materials to carry a large share of instruction. But even here stress was placed on the concept of "aids" to instruction: "Multi-sensory instructional materials should be conceived as aids rather than as self-contained teaching devices. Official statements of training doctrines in the armed forces have consistently emphasized the point of view that all kinds of training aids and devices should be used as aids and not as teachers."[7]

Note that the conceptual framework very clearly states the relationship between teacher and materials: "conceived as aids." Presumably, if an instructional package was too self-contained, a few holes were punched in it. Seriously, a crucial difference exists between designing instructional materials with the "given" that someone will be present to fill the gaps and designing media to be completely self-instructional. The psychologists were in an advantageous position when developing programed instruction by not being bound by a prior tradition of instruction.

The concept of audiovisual materials as "aids" is even more firmly imbedded in public education. This is due primarily to the tradition of the teacher as sole arbiter of what is used in the classroom. As many instructional decisions as possible are left to the classroom teacher by curriculum planners, including, of course, decisions in regard to media.

As a result audiovisual materials enter the instructional process at the classroom implementation level, as shown in Figure 1, either when the teacher is casting about for materials that might "aid" instruction or when the audiovisual director institutes a search of catalogs for appropriate materials.

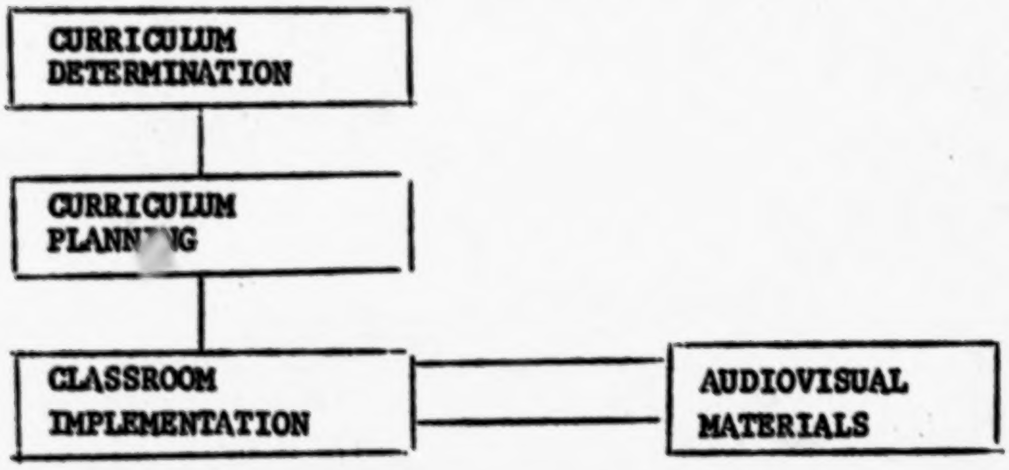

Figure 1

Even where audiovisual materials are indicated in courses of study and other guides, the principle is the same since the final decisions are made by the classroom teacher.

However, from experience audiovisual directors have been made aware that the materials of their profession are far more than aids. At one time or another, all directors of media programs have seen media take over the burden of direct instruction. The introduction of language programs and added emphasis on science in elementary schools and change-over to the audio-lingual approach in secondary schools are specific cases in which materials often became direct instruction. Many discovered pragmatically that curricular innovations accompanied by well developed sets of materials fare better than those that aren't.[8]

In the middle 1950's educational film producers started releasing series of films which could, and did in many cases, assume a major part of the instructional job. An outstanding example of this is Encyclopaedia

Britannica Films' biology program. McGraw-Hill's Planet Earth Series, based on the projects of the International Geophysical Year, has formed the basis of earth science classes in some junior high schools. In fact, producers are now combining media integrated so thoroughly that to break into the sequence as designed invites disaster. _Parlons Francais_ is a course in French for elementary school that links films, tapes, and text in a sequence that must be followed for optimum results. _La Familia Fernandez_ is, perhaps, an even more comprehensive treatment of Spanish.

To refer to the examples cited as "aids" to instruction is less than inadequate; it is deceptive. These _are_ instruction. And we suddenly realize that we are buying teachers, not aids.* We also realize that these "systems" of materials do not fit the old rubric shown in Figure 1; rather, they must be planned for at the curriculum planning stage. They also begin to raise the question as to whether or not classroom teachers should make all decisions regarding their use.

Concomitant with growing awareness of materials as direct instruction were developments in newer media and methods of instruction which began to change the fundamental relationships between materials, teachers, and instruction.

Television for instruction was the first major introduction to educators of the potential of media as complete instruction. Televised instruction required determination of instructional goals, selection of television instructors, the arrangement of an orderly sequence of instructional components, including efforts of the classroom teacher if there was one, development of a climate of acceptance by faculty and students, measurement of attainment of objectives, etc. The report on the use of closed circuit television by Carpenter and Greenhill of Pennsylvania State University documents this first "start to finish" use of media, a systems approach.[9]

---

*I am indebted to James Thompson of the University of Florida for this comment.

Carpenter's experience with television led him to a systems approach, which was expressed very well in a 1960 symposium at Stanford University:

> "A system design for an educational enterprise would provide: A conceptual framework for planning, orderly consideration of functions and resources, including personnel and technical facilities...the kinds and amount of resources needed, and a phased and ordered sequence of events leading to the accomplishment of specified and operationally defined achievements. A systems approach should provide a way of checking on the relation of performances of all components to factors of economy and should reveal any inadequacies of the several components, including the faults of timing and consequently of the entire system."[10]

Educational television has also helped clarify the future function of the classroom teacher in a true instructional system. Where television has been integrated with classroom instruction, the classroom teacher shares the responsibility of the learning environment with the television teacher. In Anaheim, California, televiewing is mandatory, and the classroom teacher is required to cooperate with the television teacher in the instructional process.

The concept of shared responsibility is crucial and will come hard to many teachers. There are classrooms in which the classroom teacher has fought the television teacher for authority and control. It is strongly recommended that all directed teaching in programs of teacher preparation include experience in shared responsibility with media, television preferably. The teacher of the future will be a very vital sub-system in the total instructional system, and he must be trained to function in that capacity.

Filmed courses, by-products of educational television, served to introduce many educators to the concept of direct instruction with media. The Rocky Mountain Area Project, headquartered in the Colorado State Department of Education, has had outstanding success in teaching physics, chemistry, and the humanities by a well coordinated system of classroom teachers and media. The practice of shared responsibility between teacher and media was very skillfully handled.[11]

The language laboratory movement threw content and media specialists together in an intimate working relationship that produced very strange and startling experiences. For the first time, language teachers discovered that the mode and materials of instruction interact with instructional behavioral objectives and methods. Many language teachers did not understand that a language laboratory requires a different method of instruction: that print stimulus methods are not audio stimulus methods. On the other hand, the audiovisual specialist was shaken out of his comfortable bookkeeping-procurement function and introduced, often for the first time, to the rigors of developing curriculum materials to meet specific curricular objectives. The novelty of the roles played by both has caused so many difficulties that the language laboratory has not yet reached its potential value. One of the lessons learned by audiovisual directors in this encounter is the incredible quantity of materials required by technology when media are used for direct instruction. The classroom teacher, at the same time, was experiencing another instance of shared responsibility with media.

Programed instruction has been credited by some with introducing the systems approach to education. By analyzing and breaking down content into specific behavioral objectives, devising the necessary steps to achieve the objectives, setting up procedures to try out and revise the steps, and validating the program against attainment of the objectives, the developers of programed instruction succeeded in creating a small but effective self-instructional system, a technology of instruction. Certainly programing has reawakened the interest of public school educators in focusing on behavioral objectives. If educators concentrate on the behavior of the student, attainment of educational goals may be sought with regard only to the best methods available rather than to a prior tradition of "proprietary rights," so to speak.

However, programed instruction is a very small system. A system can fail even though it functions efficiently if its parameters are too limited in the initial design stage. It would be better to regard programing as a sub-system of the instructional system.

Television, language laboratories, programed instruction, and packages such as Parlons Francais, unlike traditional audiovisual materials, must enter the instructional system at the curriculum planning phase. As indicated in Figure 2, the shift from the classroom implementation level to that of curriculum planning requires the use of a new term instructional technology. Audiovisual as a designation of a group of materials and equipment is subsumed under instructional technology.

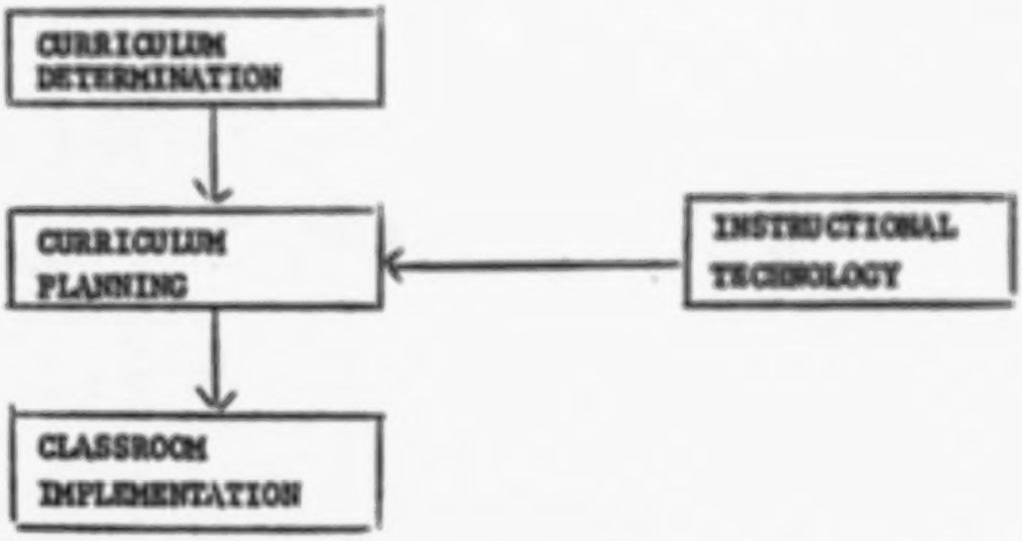

Figure 2

But more important for our purposes, Figure 2 changes the conceptual framework of the instructional system. This change is symbolic of the energy infused into a sub-system media, causing pressure to resynthesize the system. Hoban expressed it this way in an address to the American Association of Colleges for Teacher Education:

> "Thus, in these two concepts--one, the newer media as primary instruments of instruction, and, two, the control of learning by remote control of stimulus and response--lie the seeds or the sprouts of the major developments now evident in educational television and in programmed self-teaching (teaching machines).

> "In forty years, this concept of newer media in education has grown from one of a device for a lesson presentation to one of a complete system of remotely controlled instruction covering an entire course. Within this conceptual span, one has a choice of alternatives and combinations of media in teacher education and means for preparing teachers to deal effectively with these media in the schools of tomorrow, today."[12]

A new paradigm is created, one which has far-reaching implications for organization of the instructional process, one which, I submit, must become accepted as the conceptual framework of future instructional systems.

IV. The Mediated Teacher and the Classroom Teacher

Traditionally, decisions regarding methods and materials of instruction, instructional sequencing, in fact, almost the whole instructional "ball of wax" are made in the classroom by the classroom teacher. As Guba stated, "...we must allow her to decide at what times and in what ways to utilize the entire armamentum of devices and materials..."unless, of course, "...we wish to scrap completely the notion that the teacher is, in her classroom, an autonomous professional...." I am not really interested in scrapping that notion, but I do want to explore the use of the word teacher. When instructional technology, as defined in this paper, enters the instructional process more than one "autonomous professional" is present in the classroom. The instructional judgments that are made depend on who has been assigned what task.

In a paper presented to a conference on the Newer Educational Media, William M. Brish, Superintendent of Schools, Hagerstown, Maryland, put his finger squarely on the issue: "A television set does not replace the teacher or the need for the teacher. Television does not produce or teach lessons. When direct instruction is presented by television, a teacher is doing the teaching. What is taught and how it is taught depends on that teacher and is determined by the educational philosophy of that teacher or the school system in which he teaches."[13]

A little further on, after listing instructional activities his staff found television useful for and then instructional activities more amenable to classroom instruction, he added: "...teaching teams have been organized with a studio teacher responsible for the items that television can best do, and a classroom teacher caring for those which seem to be handled better by direct personal contact with pupils."[14]

Televised instruction forced Brish to distinguish between two kinds of teachers: studio teacher and classroom teacher. This distinction can be generalized into a more useful differentiation: mediated teacher and classroom teacher. A teacher whose instructional efforts are presented to students in mediated form will be referred to from here on as a mediated teacher. A teacher who is physically present in the classroom will be referred to as a classroom teacher. Both are professionals with all the privileges and prerogatives the term implies. For grammatical reasons, the term media teacher is used if the teacher intends to develop instruction via media; and the term mediated teacher, if the deed is assumed done.

The mediated teacher is not to be confused with a teacher with media. The latter may be either a mediated teacher or a classroom teacher. For example, a television teacher will, no doubt, use other media in his presentation, but the fact that his total instructional effort is presented to students in a mediated form defines him as a mediated teacher. A teacher whose instruction, with or without the support of media, takes place with face to face contact with students is a classroom teacher.

From the discussion thus far, I believe the meaning of mediated instruction is reasonably clear. Quantitative as well as qualitative characteristics must be considered in defining mediated instruction. I mention this to head off deliberately anyone who may be indulging in free association at this point and has decided that, really, posters and bulletin boards are mediated instruction. No, they belong in a category I refer to as the folk arts of teaching, not mediated instruction.

When instructional technology is used the word teacher can no longer stand by itself but must carry a modifier, mediated or classroom, because it is essential to identify the mode of instruction and the nature of the instructional assignment. The reason for this is that many instructional decisions, previously made at the classroom level by the classroom teacher, have been shifted to the curriculum planning level and are arrived at by teams which include curriculum personnel, instructional technologists, media teachers, and classroom teachers. At this level, as Brish pointed out, courses are broken down and specific instructional assignments made, assignments to media teachers and to classroom teachers. To put this in different terms, we can say that the curriculum planning and development level has become the center of instructional strategy where decisions are made regarding the tactics of instruction. From a system point of view, mediated teaching and classroom teaching are simply different tactics used in the strategy of instruction.

Teachers, of necessity, have always shifted back and forth from the level of strategy to the level of tactics, but until recently it wasn't necessary to bother making a distinction. Within the conceptual framwork advanced here, classroom teachers obviously remain extremely important participants at the strategy level, but it is essential that a clear distinction be made between strategic and tactical operations. After decisions are reached and instructional assignments given media teachers and classroom teachers, each group functions as "autonomous" professionals.

Media decisions may be of two kinds: mediated instruction may be made available for use as optional instruction; or students may be required to receive direct instruction in mediated form. In the first case the classroom teacher decides whether or not to use the available media. But in the second case the students have been assigned to a mediated teacher for a specified part of the instructional task, and the classroom teacher my not interfere.

Now, no problem arises if the entire course is assigned to a mediated teacher or if it is assigned to a classroom teacher. Neither is there a problem if the mediated teacher and the classroom teacher are the same person. The sticky situation occurs when a mediated teacher and a classroom teacher are engaged in a joint enterprise.

This problem is worth elaborating with an example. Suppose Mr. Jones and Mr. Smith, as classroom teachers, have been assigned to teach a course as a team. While Jones is before the class holding forth in his area of specialty, Smith sitting in the back of the room may tremble in violent disagreement over the presentation, but his professionalism prevents him from interfering. He will, no doubt, buttonhole Jones after class to discuss the issue and perhaps modify Jones' position. All educators would approve this display of professional courtesy.

However, suppose the decision had been made to mediate Jones, say, by television. Educators would now be divided. Many, perhaps most, would now maintain that whether or not Jones is tuned in on any given day is up to Smith. After all, it's Smith's class, isn't it?

No, it isn't. From a systems point of view nothing has changed but the presentation method. Jones is removed from the class by distance and perhaps by time, but those students are still assigned to him.

This is not to say that a classroom teacher cannot suggest changes in the presentation of mediated instruction, but he must return to the strategy level to do so. Usually, this is accomplished at regular meetings of the teams. Expressed in systems terminology, a sub-system may suggest adaptive changes in another sub-system but not eliminate it. Pre-service teachers need to have practise in working cooperatively with mediated instruction.

So far I have limited this discussion to television teaching primarily because the instructional situation is more familiar and the relationships are most easily identified. But once the point is accepted that instructional prerogatives are based on instructional assignments arrived at on strategy level, all other mediated teaching is included. As we have seen, programed instruction isn't an aid to the classroom teacher in the sense that the chalkboard is; it is designed to teach the behavioral objectives decided upon by another teacher. From our systems point of view, a programer (a teacher) is assigned one set of instructional tasks and the classroom teacher another set; one teaches by mediation and one by actual presence in the classroom.

Programing for language laboratories falls into this pattern, also.

The conceptual framework we have been using would easily cover packages of mediated instruction, such as the CHEM study and PSSC. CHEM study manuals specifically state that the films are an integral part of the instruction. It would be a simple matter for local school personnel to assign students to mediated instruction by way of the CHEM study and PSSC films for part of the respective courses.

This, then, is the conceptual framework of what I see as the instructional system of the future. Enough examples are already around to extrapolate the essential pattern. One of the questions we should ask about a new paradigm is this: does it not only realign the components more realistically but also open up new and productive avenues of inquiry, research, and practice? I think it does.

V. Implications for Teacher Education

Professional education does not really grasp the fact that with instructional technology we are dealing with a man-machine-man system. A flow chart of the conceptual framework I have been using is shown in Figure 3.

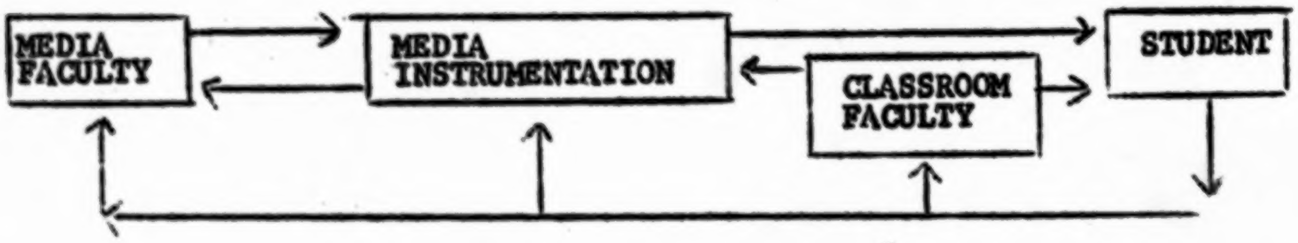
MEDIA FACULTY
MEDIA INSTRUMENTATION
CLASSROOM FACULTY
STUDENT

Figure 3

It is a simple matter to generalize Figure 3 in Figures 4 and 5.

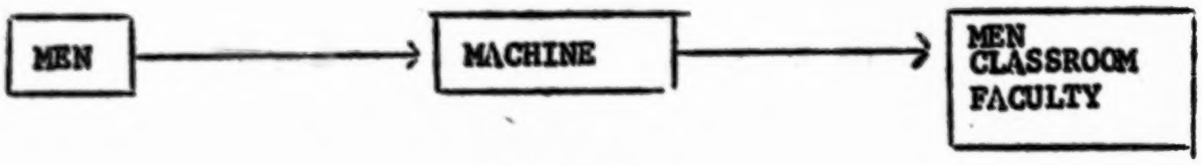
MEN
MACHINE
MEN CLASSROOM FACULTY

Figure 4

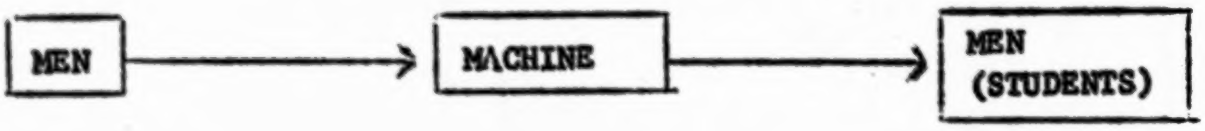
MEN
MACHINE
MEN (STUDENTS)

Figure 5

Except for textbooks, which do not affect the daily administrative pattern of the classroom, professional educators have virtually ignored the left-hand sides of Figures 4 and 5. They view the world almost entirely from the right-hand side of Figure 4. This is to be expected since their profession originated in training classroom teachers and they are firmly rooted on that side of the model in their own classrooms.

This is dangerous. Without trying to push the parallel too far, we might say that the productivity of this country is due to increasing the number of people on the left-hand side of Figure 4 in relation to the number on the right-hand side. Education now has the technology to make this move. We are on the brink of an industrial revolution in education, and much of the restiveness of the past decade comes from the fact that we are just facing problems the rest of the country started facing in the last century. If professional educators fail to realize that they are not just in the business of training classroom teachers but really in the business of training modifiers, in whatever form, of student behavior, they may be in the position of the harness maker who didn't realize he was in the transportation business.

Certainly other disciplines who are most eager to influence student behaviors in the public schools have not been unaware of the potency of the model in Figure 3. Zacharias is fully cognizant of its power. Reread the statement by Marsh on page seven. Note the emphasis on access to the student. Interestingly, one of Zacharias' main strategies was to bypass the, to him, dead end of the curriculum director.

Behavioral psychologists, more than any other group, are trying to stake out the technology of instruction as their province. They interpret this as programed instruction, of course. They are betting heavily on the left-hand side. Witness this statement from a recent publication:

> "It is appropriate to call the field developed by the engineer-psychologist 'the technology of human learning.' As the new technology grows, there is a danger that the educational psychologist may increasingly assume the role of spectator rather than that of active producer. A most embarrassing result to educationists could be the discovery that the real experts on teaching and learning may arise from the ranks of learning technologists who have never enrolled in a single course in methods of teaching.

> Such a discovery might very well place limitations on some teacher training institutions as they are now organized."[15]

Even as staunch a foe of media as Clifton Fadiman flip-flopped when he found that mediated instruction, as represented in the humanities films of Encyclopaedia Britannica Films, gave him direct access to students and bypassed the "educationists."[16]

Schools of education must recognize that the men on both sides of the machine are in the domain of professional education. Therefore, programs of teacher preparation must provide for training in three major areas.

The first area concerns handling of media normally under the control of the classroom teacher. This corresponds to utilization and production problems that are now taught in standard media classes. I am sure that other papers at this conference will cover this area fairly thoroughly.

The second area deals with the management of instructional problems at times when mediated teachers and classroom teachers work together. This is the problem of shared responsibility which I mentioned earlier. Every student in a pre-service program should be required to learn how to work with mediated teaching, particularly when student teaching. Television might very well be the best of the media to use, although programed instruction and media packages like PSSC should also be used. He should work with whatever is most typical of his subject matter field. A language major, for example, should teach about a four-week section of a semester with a comprehensive program such as La Familia Fernandez.

Since mediated instruction can be made repeatable, simulation exercises could easily be used to present the pre-service student with a variety of mediated teaching situations which he must learn to handle as a future classroom teacher. It is ironic that the greatest impact that media has had in teacher training is in simulation of student teaching experiences, and yet, as far as I know, simulating media problems has been ignored.

Pre-service teacher training should make sure that the student has an opportunity to develop skills on both strategic and tactical levels. He must participate in curriculum planning as well as in working with mediated teaching in the classroom. In this way he will develop an operational understanding of the professional prerogatives associated with strategic and tactical assignments as well as acquire skills in analyzing content in terms of mediated classroom teaching. Simulation techniques would be extremely helpful here, also.

The last area to deal with is the toughest but, to me, potentially the most important. The number of mediated teachers will increase dramatically in the next twenty years. Ten years ago there were only a few around, but with the growth of educational television stations, closed circuit systems, programed instruction, etc., the numbers are increasing rapidly. It is entirely possible that in twenty years one-third or more of the professional staff in this country will not come in face to face contact with students in the normal course of their instructional activities. They will be in mediated form. We must begin training people for this, or someone else will.

Every student in pre-service training should be required to teach a substantial piece of content in his major field in mediated form. He must specify the kinds of terminal behavior he wants the pupils to have and develop mediated instruction to achieve them. He must go through tryout and revision exercises to make sure the instruction does the job. At the end he would be required to test the students to make sure the terminal behavior was achieved. This takes a tremendous amount of skill, knowledge, and discipline. The mediated instruction developed here will not be "conceived as aids" but as "self-contained teaching devices."

Those who are interested by this experience may go on later to develop into media teachers. In this way I think we can better anticipate the needs of the future.

There is no question that mediated instruction is on the side of organization, which is not exactly a characteristic of most curricular and instructional planning. The exercise above will help to sharpen the pre-service student's ability to clearly define instructional tasks and then solve them.

By making the three areas above part of the teacher preparation program, the profession will be in shape to move ahead in an instructional systems framework of great flexibility and power.

FOOTNOTES

1. Egon G. Guba and Clinton A. Snyder, "Instructional Television and the Classroom Teacher," *Audio-Visual Communication Review*, XIII (1965), 25.

2. Paul E. Marsh, "Wellsprings of Strategy: Considerations Affecting Innovations by the PSSC," in *Innovations in Education*, ed. Matthew B. Miles (New York: Bureau of Publications, Teachers College, Columbia University, 1964), p. 251.

3. C. W. Churchman, "On the Design of Educational Systems," *Audio-Visual Instruction*, X (1965), 365.

4. Leonard C. Silvern, "Reply to Questions about Systems," *Audio-Visual Instruction*, X (1965), 367.

5. Robert Heinich, "A System of Instructional Management," unpublished paper (University of Southern California, 1962), p. 5.

6. This section is based on section from Robert Heinich, *The Systems Engineering of Education II: Application of Systems Thinking to Instruction*, Instructional Technology and Media Project (University of Southern California, 1965).

7. John R. Miles and Charles R. Spain, *Audio-Visual Aids in the* Armed Forces (Washington, D. C.: American Council on Education, 1947), p. 79.

8. See Marsh, pp. 230-231.

9. C. R. Carpenter and L. P. Greenhill, *An Investigation of Closed Circuit Television for Teaching University Courses*, Report No. 5 (University Park, Pennsylvania: The Pennsylvania State University, 1958).

10. C. R. Carpenter, "Approaches to Promising Areas of Research in the Field of Instructional Television," in *New Teaching Aids for the American Classroom*, ed. Wilbur Schramm (Stanford, California: The Institute for Communications Research, Stanford University, 1960), pp. 75-76.

11. Second Annual Report, Rocky Mountain Area Project (Denver, Colorado: Colorado State Department of Education, 1959).

12. Charles F Hoban, Jr., "Research in New Media in Education," paper presented to the American Association of Colleges for Teacher Education, 1962, pp. 13-14.

13. William M. Brish, "Administrative Changes Dictated by Research in *Newer Educational Media*," in Newer Educational Media (University Park, Pennsylvania: The Pennsylvania State University, 1961), p. 50.

14. *Ibid*., p. 53.

15. Finley Carpenter and Eugene E. Hadden, *Systematic Application of Psychology to Education* (New York: The Macmillan Co., 1964), p. 3.

16. Clifton Fadiman, "The Role of the Humanities in the Secondary Schools," address at annual convention of National Council of Teachers of English, Miami Beach, Florida, 1962. Reprints available from Encyclopaedia Britannica Films.

CHAPTER III

EDITOR'S COMMENT ON NORBERG'S PAPER

The Norberg paper considers a wide range of theoretical possibilities from which an instructional systems specialist might make a selection as the basis for the content, process, and/or experience decisions. As an examination of Norberg's paper will disclose, almost every theory of learning, perception, and communications along with iconic signs can all be marshalled to support certain kinds of media applications. The decision which the systems expert makes will be dependent upon his judgments about the manner in which humans learn and the ways in which content and methods expedite that learning.

Of all the theories, Norberg indicates that the one in most current use is the S-O-R theory oriented toward emphasis on response. Therefore, his paper makes a strong case for a learner-centered and response-oriented model. It should be noted, parenthetically, that although Norberg does not give greatest recognition to the cognitive approach to learning, it is this theory which is followed by most curriculum developers at the present time.

It probably is unrealistic to expect that every teacher at either the collegiate or pre-college levels should be highly conversant with and knowledgeable about all of the theories which Norberg discusses. In order to meet this dilemma and, more importantly, to carry out the basic thesis of this report, it is suggested that only those theories which can be demonstrated and tested in either hard or soft ware be included. Theory should not be studied for the sake of theory; a theory should be practicable and testable in some concrete form. As is suggested throughout this publication, final decisions about content, process, or materials can be made only after empirical testing. In the same way, decisions about which theories are best can be made only after they are tested, and in order to evaluate them, the exemplification of them must exist in either material or equipment. One way in which the theories Norberg elucidates can be tested by prospective teachers is to examine the proposals of Curl and Kemp in the chapters which follow.

THEORETICAL BACKGROUND REQUIRED BY TEACHERS IN THE USE OF NEWER MEDIA

Kenneth Norberg*

In education as in other fields of "practical" human endeavor, the theorist often treads a lonely and hazardous path. Not only must he deal with conflicting theoretical points of view, but he must also guard against the skepticism and impatience of practitioners, who are frequently inclined to question the importance, if not the pertinence, of the whole theoretical approach. These difficulties arise in part from the relative immaturity of education as a field of scientific inquiry and the unstable, often fragmentary theoretical structures of the behavioral sciences that feed into it. But the problems of the theorist also arise in part from a culture which places a strong emphasis upon empirical solutions that are valued because "they work" and which may deride the "hemming and hawing" of the theoretician as mere "word pushing" or as based upon unrealistic assumptions that just don't work out in practice. Who in education has not heard the criticism that methods courses fail to "bring theory down to practice" or the admonition that a beginning teacher has to "forget" 80 percent of what he was taught in his education courses before he can function effectively in the classroom? Such criticisms are embarrassing and difficult to counter because they usually contain a significant element of truth. However, such statements are usually also grossly inadequate and misleading.

Lest there be some readers who might question the relevance of this paper dealing with theoretical background, the following basic assumptions should be made explicit at the outset. First, there is no practice, no practical procedure in teaching or any other systematic human enterprise that does not involve a set of theoretical assumptions, though these may not be explicit or even fully consistent one with another. Second, the most general purpose of theory is not to enunciate some formal, logical basis for a prescribed course of action, not to mold practice to some rigid formula, but to free behavior in practice from certain types of constraints which otherwise operate: the constraint of the traditional, which tends to perpetuate existing practices merely because they have worked in the past and their inertia tends to sustain them; the constraint of the narrowly empirical, which confirms as successful outcomes those which meet a rigidly prescribed set of tests without considering the problem of holding the derivation of criteria open to inspection and reconsideration; and finally, the constraint of the blindly emotional, which clings to existing practices or leaps toward proposed changes on the basis of arbitrarily selective considerations which appeal to the personal bias of individuals. Frequently, the several types of constraints upon practice just noted are related and work in concert. Also, it must be noted that practice is always constrained and emotionally biased in some degree, a circumstance that is both natural and advantageous within certain limits. The task of the theorist is not to deny the value of the stability and direction given by tradition, not to arbitrarily dismiss the "tried and the true" or the necessary force of emotional drive, but to help practitioners become fully conscious of the assumptions and other conditions that govern their own operations. Beyond this, it is to provide theoretical tools that can enlarge the range of options and open up hitherto concealed or unimagined avenues of development through analysis and through the use of experimental procedures and evidence.

---

*Professor of Education, Sacramento State College, Sacramento, California

I. Is There a Science of Teaching?

Development of teacher competencies in the use of educational media is a piece of a larger problem: the preparation and on-the-job training for the profession of teaching. In order to deal with the more specific question, which is the task of this paper, we must first make some assumptions regarding the total enterprise of teaching and the nature of the professional training it requires. This caveat is especially germane in the present period of rapid transition, a period marked by explosive growth and technological change, by accentuated demands upon the schools, and by massive criticism of education and the "educationists," with the recent resulting turmoil shown in California and other foci of change in teacher education.

Is education a discipline in fact or potential? Does the process of instruction constitute an area of scientific inquiry in its own right? Is teaching a true profession in the sense that medicine or engineering is a profession? These questions are difficult and complex, and complete, convincing answers may not be entirely available at this time. But they must be considered, and the relevant assumptions must be stated explicitly because the character of the underlying postulates governs the whole concept of teacher education right down to the specifics and "mechanics," as will be shown.

James Conant, in his widely read and very influential book, The Education of American Teachers, has taken the position that the concept of a science of education is not a useful one. "The question is whether it is useful to try to cover with the word, 'science,' a vast field of human activity directed toward practical ends. I have come to the conclusion that it is not..."[1] Rather than a science or discipline of education, Conant would prefer to speak of academic disciplines or educational sciences, which may contribute useful "predictive generalizations" that teachers can use in their work. Since there is no true discipline of education as such, the role of the professor of education is questionable, with the exception of the "clinical professor," whose function will be discussed presently. At best, the professor of education is an "intermediary to bridge the ravine that separates theory and practice" and even those who fulfill this role should not be professors of education but rather professors of philosophy, history, sociology, and psychology proper, professors in true disciplines "who have a commitment to the public schools and their improvement."[2] (What the latter qualification means specifically is not spelled out.) It is implied that professors of education often do not fulfill a valid function in teacher education. For instance, Conant reports having heard the frequent complaint that professors of education "spend too much time mouthing platitudes about what a 'democratic' education ought to be and too little time teaching their students to understand, analyze, and criticize the functions that various competing social groups (including educators) would impose on the schools as conditions of 'democratic' education."[3] This line of criticism is carried further in his discussion of foundations courses, in which he finds that, with occasional exceptions, those in charge "often attempt to patch together scraps of history, philosophy, political theory, sociology, and pedagogical ideology" and that frequently these professors are not well trained in any of the parent disciplines.[4]

Unfortunately, there is considerable truth in Conant's charges, as anyone who has been in the field of education and/or teacher training for a time must know. It may be that some of the worst and some of the best teaching in American colleges and universities is found in foundations and some other courses in the professional sequence in education, in this writer's opinion. Conant has spotlighted this weakness, at the same time creating the impression that most teacher education courses as now conducted are trivial and that most teacher educators are ineffectual or worse. What is even more challenging is the related thesis that there is no point in talking about a discipline of education. There is an obvious and logical connection between Conant's denial of the validity of the notion of a science of education and his low opinion of professors of education. No science; no scientists. How can there be scholarly endeavor or significant research in a field that has no scientific standing in its own right? Hence, it appears that Conant would just as soon eliminate professors of education, with one exception, the "clinical professor," whose function will now be examined.

As is well known, Conant considers practice teaching to be the one "indisputably essential element" in the professional education of teachers. He suggests that the person to play the key role in the management and supervision of practice teaching would be the "clinical professor," a term proposed by Robert Bush of Stanford University.[5] The person fulfilling this role would carry such a title as Professor of the Theory and Practice of Elementary Teaching. There would be no junior or intermediate grades to this position, and the salary would equal that of any professor in the institution. The clinical professor would be an experienced and excellent schoolteacher himself, but he would not need to hold a Ph.D. degree and "would not be expected to do research or publish papers."[6] The conditions just noted are of particular interest. Conant advances the perfectly cogent reason that the person who serves this critical function in the education of teachers should keep close to classroom teaching and should be removed from the usual pressures to conduct research or publish articles and books. This appears sound as far as it goes, but note that Conant has already discredited, or at least created serious doubts about, the roles of other professors of education. Thus, his total argument leads very close to the position that the only clearly valid professional in the field of teacher education, aside from possible representatives of the contributing, true disciplines, is an expert teacher who need not have a Ph.D. and is not expected to write or conduct research. The clinical professor has a nice, well-supported job and he could be worth every cent of it, but his professional status is actually left in doubt, if not emasculated. He might well become just the highly respected, expensive residuum of a questionable profession and a pseudo-discipline that turned out to nothing at all.

Please note that the foregoing comments on Conant's book are highly selective and must, because of limitations of space, fall far short of complete analysis. They should not be interpreted as a total rejection of his position. On the contrary, there is much solid truth in his criticisms and a good deal to be said, in my opinion, for the notion that professors of education should have better training in the source disciplines. Much of the professional sequence in teacher education offered by many institutions has been trivial, repetitive, and poorly taught. I merely fail to accept his premise that the very notion of a discipline of education is fallacious and the implied conclusion that the ills of teacher education can be attributed, in large part, to this supposedly mistaken idea. What is conspicuously missing in Conant's account of teacher education in America is an adequate acknowledgement of the growth and steadily increasing maturity of experimental investigation and scholarly analysis in a field that is struggling to define itself as an area of scientific inquiry.

A primary assumption of the following discussion is that education, at least with respect to certain central and critical functions, does lend itself to analysis and experimental inquiry and therefore constitutes, in potential at least, a field of scientific study in its own right. It is true, as Conant points out, that education is "a vast field of human activity directed toward practical ends," just as medicine, engineering, and many other fields are vast, complex, and directed toward "practical" ends. There is, of course, no all-encompassing science that would enable us to reduce all educational decisions to hypotheses of the sort that can be resolved by the methods of experimental science. Teachers, like medical practitioners, make many decisions which involve legal and moral judgments as well as scientific knowledge and evidence. Often, they must make educated guesses which go beyond the limits of present scientific knowledge. Does this mean that persons working in this field are by definition incapable of formulating specific questions relating to instructional functions as problems for analytic and scientific study, that a specialist in education is incapable of dealing with such problems with perspective, solid scholarship, and rigorous experimental method simply because this is a complex, difficult, and relatively undeveloped field of inquiry? I think not.

It could be that whether or not we deny education the possible status of a discipline is a matter of words, as Conant at one point suggests. But we can't have it both ways because it makes a great difference which way we look at it. Hence, it becomes more than a matter of words. The point is simply that teachers, educators generally, must assume primary responsibility for the scientific study and management of their peculiar occupational functions. If they fail to do this, they relinquish their proprietary rights as a profession. Without proper autonomy an occupational group is something less than a profession; how much less is suggested by Conant's conception of the clinical professor, who is not expected to investigate his own function as a teacher, or the properly oriented professor of education, who is not really a professor of education at all but simply a mediator of knowledge generated by other, older, more respectable disciplines.

If there is to be no science of teaching, then there will certainly be no scientific approach to the use of audiovisual materials and methods in teaching. Thus, a logical conclusion would be to leave the development of audiovisual competencies to the services of an audiovisual technician, who as Conant suggests, would serve as one of a corps of assistants or consultants to the clinical professor and to his students during their period of practice teaching. On the other hand, if we take seriously the notion that the training of teachers is training for a profession and for responsible participation in the development of an area that has begun to establish itself as a cross-disciplinary field of scientific inquiry, then the preparation of teachers as users of various media becomes a problem of larger dimensions, in a sense a problem that is integral to the total instructional task. To envisage the audiovisual aspect of teacher education in proper perspective requires at least a preliminary glance at the more inclusive task of bringing scientific knowledge and method to bear upon the instructional process.

The state of the art and the education of teachers. There is, of course, no fully developed science of learning, let alone a science of teaching or any aspect of teaching, such as the utilization of audiovisual materials. How, then, can we seriously propose a list of desired teacher competencies related to the theoretical framework of audiovisual instruction? In an earlier paper dealing with the place of learning theory in the training of audiovisual specialists, the writer took the position that professionals in the field of education can work toward a theory of instructional technology at the same time that its source disciplines are still developing their own and that this, in fact, is being done and must continue if there is to be a viable field of professional specialization in educationalmedia.[7] Hilgard has pointed out that technology doesn't always have to wait for pure science but may go ahead of it, also that the advance of knowledge through the interplay of pure science and technology is a two-way process.[8] To renounce current efforts to introduce scientific rigor into the study and control of instructional processes, to abandon present analytical studies indigenous to the field merely because the state of knowledge in psychology and other contributing disciplines is still fragmentary, unsettled, far behind the physical sciences, would be to fail by default, to give up the important, though relatively meager, progress that has been made. It would be to forget that the applications of scientific knowledge and method in every field of practical human endeavor depend upon the development of a suitable technology and a related interdisciplinary field of scientific inquiry which begins where the base disciplines leave off. Some critics of current trends in education and teacher education seem to be saying, "Let's give up this pretense that education can be a science. If the teacher is thoroughly grounded in content, common sense coupled with the expert guidance of master teachers will do the rest." A combination of factors, including the unfortunate heritage of inadequate general education and impoverished teaching that was found in many normal schools and is still evident in many teachers colleges and departments of education, has produced a vast amount of shallow professional literature and just plain gobbledegook. This circumstance lends plausibility and force to the charge that teacher groups and educationists try to guard their professional status by laying claim to "some esoteric body of knowledge that sets them apart from those laymen whose general knowledge is equivalent to theirs, or in some cases more extensive."[9] The answer to the charge is not in counter arguments but in the growing substance of professional achievement, in scholarship, in research, and in good teaching, which there is to see in professional journals and books, in research reports, and in the classrooms. We can still find plenty of the trivial, the pretentious, the repetitious, and the platitudinous in the literature and courses of teacher education. Some of the critics are helping to spotlight these faults and hopefully to eliminate them. We in the profession should acknowledge this helpful criticism but not be carried away by it to the point of professional hari-kari. Competent scholars and investigators as well as informed and wise teachers have been at work in the field for a long time. The viable results of their efforts should not be overlooked or forgotten. What is even more important, their work should be digested, analyzed, and continuously revised, refined, and extended. This is the way a field of inquiry develops and matures. If there is any substance at all in the developing science of teaching, this must constitute a good deal of the hard core of teacher education. If there is a usable residue of experimental findings and theory which is applicable to the total instructional task, some of this should be useful in training teachers for the most effective use of instructional materials and media.

II. Teacher Competencies and the Place of Theoretical Background

One of the earlier formal statements dealing with the subject of teacher education and competencies in audiovisual instruction was the Noel-Leonard document, Foundations for Teacher Education in Audio-Visual Instruction, published by the American Council on Education in 1947. Under the heading of "philosophical and psychological factors underlying the use of audiovisual materials and equipment in the classroom," this publication stressed the relevance of underlying philosophic and psychological considerations and dealt quite briefly with several specific theoretical notions, such as the need to provide experiences that are "personally and socially vital to students," the need to recognize individual differences and their implications with respect to the use of a variety of instructional materials, the advantage of concrete experiences in promoting readiness to learn, and the use of the dramatic and emotional qualities of some audiovisual materials in structuring attitudes. The authors suggested that teachers should know something about the "nature of the aids" and the "principles of good teaching that affect the selection and use of these materials."[10] They also proposed that teachers should know the results of research studies and their implications for instruction.

Much more recently, Fulton and White reported on a list of audiovisual competencies developed by the Teacher Education Committee of the Department of Audiovisual Instruction, which were also incorporated in the "Standards and Guides" used by the National Council for Accreditation of Teacher Education in accrediting teacher education institutions. The proposed competencies were listed under four headings as follows: (1) proficiency in selection and evaluation of materials, (2) proficiency in the utilization of appropriate instructional materials, (3) proficiency in production of simple instructional materials, and (4) proficiency in the preparation and use of physical facilities. Explicit mention of theoretical foundations was given only under the second heading where it was stated that "effective use of audiovisual materials may be facilitated through a thorough understanding of the basic philosophy underlying the successful use of audiovisual materials; an understanding of the place of audiovisual experiences in the learning process; and an appreciation of the advantages of a wide range of instructional materials."[11]

An examination of recent textbooks for the general course in audiovisual education reveals that these books ordinarily include one or two introductory chapters dealing with some of the social, psychological, and technological factors underlying the use of audiovisual materials in instruction. One widely used text, for instance, cites the ubiquity of the modern communication devices and their impact upon the total community, the growth of the school population and the expansion of knowledge as a dual challenge to teaching, and the recent, rapid infusion of technolog in education. Communication theory and learning theory are mentioned, and several rather broad implications are drawn. There is also a limited amount of discussion of such indigenous audiovisual concepts as "verbalism" and concreteness of experience as factors affecting human learning. On the whole, it is perhaps accurate enough to say that most audiovisual textbooks offer, or at least note the existence of, an underlying theoretical foundation but that the treatment of factual and descriptive information, explanatory sequences dealing with various procedures and skills, and other practical material leaves scant space for theoretical discussion.

Moreover, it is worth noting that the typical audiovisual course is widely and properly regarded as highly practical and specific in content, a view reflected in the attitudes of many students and teachers, who are drawn to the down-to-earth, how-to-do-it features of audiovisual courses and frequently inclined to be impatient with attempts to deal with the more theoretical aspects. Conant's comments regarding special methods courses and the audiovisual methods course in particular are significant in this regard.

> "The techniques involved in such courses are likely, given the rapid advance of technology, to become quickly obsolete. And, fortunately, they can also be rather quickly learned by one who so desires. While it is useful for teachers to know the techniques and the instructional materials available for use with these techniques, this material is highly specific, subject by subject, grade by grade. It seems to me, therefore, that the methods and materials can best be presented in the context of special methods instruction, which accompanies and is closely related to the actual practice-teaching situation. The expert in audio-visual methods should be available to the student who, with a specific instructional unit in mind, asks what material is available and what techniques for presenting it are recommended."[42]

It is not surprising to find in the ensuing discussion that Conant alludes to audiovisual specialists as "audiovisual technicians" and that their particular contribution to the student teaching experience would be mediated by the clinical professor of education.[13] Theoretically, there would appear to be a good case for placing audiovisual methods instruction in the context of practice teaching, although no advantage and some definite negative aspects were found in a recent experimental study.[14] What is more at issue is the relegation of certain aspects of teacher education to the strictly specific, the technical (in the limited sense), the merely empirical. If Conant's position is valid here, he could dispose of the problem of this paper very neatly by simply denying that it exists. We have already dealt with the issue of the usefulness of the concept of a science of teaching. If it is productive to apply the tools of experimental inquiry to the study of instruction, I see no reason to exclude any particular type or phase of instructional technique. Indeed, if the sheer amount of instructional research centering upon audiovisual materials and methods in recent years is any index of scientific interest, it should be apparent that much of the current exploration of instruction revolves around questions regarding communication and the various instruments and materials used to effect communication in the classroom. While this experimentation varies greatly in quality, its very existence and the persistent growth of vigorous research efforts in the schools and laboratories attest to the early struggles of an emerging discipline and to the vital need of accompanying theoretical development. The end product in view is presumably the continuing development of a science of instruction, including principles that govern the use of the various media and materials of teaching.

Teachers, like general practitioners in medicine, need not be capable of independently designing and conducting experimental research studies, but as members of a professional group they ought to be able to marshal the scientific resources of their own field and to interpret and apply the findings of experimentation in education with adequate perspective and background information from the behavioral and social sciences, from philosophy, from literature and the arts, and from the other disciplines that contribute to a liberal and truly professional type of teacher education. With respect to the use of media in particular, teachers ought

> to understand the explosive growth of modern technology, particularly in communications and the storage and retrieval of information;
>
> to be conversant with the somewhat delayed but rapidly accelerating changes that are now resulting from the impact of new technology upon education;
>
> to have a thorough grounding in the psychology of learning, including orientation to various theoretical perspectives and corresponding lines of research in instructional techniques;
>
> to understand the concepts of operations research and systems analysis as they have developed in the scientific study and management of military and industrial operations and recently in experimental applications in education;
>
> to be acquainted with the various and conflicting strands of perception theory and to have some grasp of the bearing of perception theory and research upon instructional procedures;

to have at least an elementary grasp of the state of communication theory, its relationship to perception theory, and its use as a tool in the analysis of instructional problems;

to have at least an introductory acquaintance with the broad scope of instructional research as related to the use of media and its prominent underlying theoretical perspectives, such as experimental developments in linear programing as related to reinforcement theory or recent research in cognitive development testing and refining the theories of Piaget, Inhelder, Vygotski, etc.; and

to have some understanding and appreciation of the limitations and conspicuous gaps in present instructional theory and research, as in the case of our present very limited knowledge of the nature and functions of iconic signs.

III. Theoretical Foundations: A Closer Look

The concise and rather bald statement just given regarding the background information and theory that teachers ought to have as a part of their training for the use of educational media requires some elaboration and some explanation. It will be convenient to develop the rationale in two parts: one dealing with the growth of technology and its impact upon teaching; the other with relevant concepts in the behavioral sciences.

1. The impact of technology. We have already indicated that most recent textbooks in audiovisual education deal with the growth and effects of technology in modern life and education. The treatment in such sources tends to be rather cursory, so much so that we are inclined to wonder whether such instruction can have any measurable effect upon subsequent teacher behavior. We can readily envisage a wider and deeper treatment of the subject. For instance, the instructor could assign readings in the works of Lewis Mumford and C. P. Snow. He might even ask his students

to read Samuel Butler's amusing little novel, Erewhon, for added literary perspective. But how could this be done in the usual two- or three-unit course in audiovisual methods, and what would be the point, anyway? Both questions are interesting, but only the latter will be considered now.

The point at issue is that the very nature of the instructional task has been altered by revolutionary technological developments. Teachers who do not understand the scope and character of the technological revolution are out of date as teachers. As Alvin Eurich puts it,

> "Clearly, any teacher or organization that blindly opposes the development of mechanical aids to learning is not defending the teaching profession, but blocking its true development into a modern profession. What needs defense and promotion is the truly professional core of the teacher's role, the guiding of learning, not the peripheral tasks of drilling, conveying information, etc. There are only two courses for a teaching profession faced with new and powerful means of communication and learning: upgrading or downgrading. Teachers will become more than they are, or less. As has truly been said, any teacher who can be replaced by a machine, should be!"[15]

Teachers need to understand the critical necessity of organizing instruction so that mechanical and repetitive functions can be delegated to machines to free more of their time for creative and truly professional work. Technological answers which are suitable for large-group presentations with a minimum of immediate student feedback should be sought for instructional functions that are merely massive to allow teachers to devote a greater proportion of their time to the instructional needs of small groups and individuals.

Still another factor, which may be less apparent, is the changing character of the whole problem of utilization of instructional materials.

In the first fifty years of this century, technological changes in education augmented problems of utilization mostly by increasing the number of devices and kinds of materials with which the individual teacher was required to deal. Parallel to this development, the audiovisual courses of the 1930's, 1940's and early 1950's usually contained nominal amounts of psychological background material and discussion of media characteristics combined with heavy emphasis on techniques of use, demonstrations, preparation of materials, and laboratory practice in the operation of motion picture projectors, tape recorders, and various devices that the teacher could use independently in his own classroom. Such training will continue to play an important role in the education of teachers but with some gradual and important modifications. In the last fifteen years more and more teachers have found themselves involved in the use of complicated technical systems that cannot be operated on an independent basis. Television, programmed instruction and teaching machines, language laboratories, automated instructional systems, and team teaching have introduced new and different kinds of utilization problems. On the one hand, the teacher is involved in the joint use of instructional systems in which he may be completely relieved of the mechanical aspects of operation of equipment. On the other hand, the equipment used by the individual teacher tends to be reduced in size and weight and/or simplified in operation, as in the case of the cartridge loading 8mm projector. The net result of such changes is that the teacher is relieved of some of the risks and difficulties involved in the operation of equipment but at the same time encounters new and more complicated utilization problems that result from more highly integrated instructional procedures. If present trends continue, more teachers will give up some individual control of certain aspects of instruction and accept more specialized roles in the joint use of complex technological systems by groups or teams with the aid of technical assistants.

> "In tomorrow's schools, the teacher's difficulties in using the technology of instruction will arise mainly out of the formidable task of understanding the place of the media and changing role of the teacher. The skills needed to solve these contemporary problems lie primarily in the areas of experimentation, planning, and human relations. Good utilization has never been an easy goal. It is significant that the problem becomes even more difficult as teachers are relieved of the mechanical operation of instructional tools--a convincing demonstration that effective teaching depends primarily upon more fundamental understandings and skills."[16]

2. Theoretical foundations from the behavioral sciences. We have just outlined some of the background information and concepts that might help teachers to understand the impact of the technological revolution that is now in progress in education. We turn, now, to some of the theoretical considerations that seem to be involved in effective use of the media and materials of instruction viewed primarily from a behavioral standpoint.

a. Psychological background. Perhaps the least controversial element in teacher training programs is a sound course in the psychology of learning. Such a course is almost invariably required, and it would seem to offer much toward the development of specific competencies in the use of media and materials. What psychological information--more precisely, what sort of and how much theoretical background in this area is required to produce teachers who are truly competent in the use of the media of instruction?

The problem is complicated and somewhat discouraging in at least two major respects. Many students who are preparing to be teachers come to the usual required course in educational psychology with the somewhat sketchy background of a single introductory course in psychology. Then, in the professional course, they traverse a rather wide range of topics, all relevant to the process of instruction; but they frequently do not have sufficient time to penetrate the subject in sufficient depth to produce lasting and significant changes in behavior related specifically to the theoretical level of treatment. The other part of the problem, mentioned earlier, is the relatively undeveloped state of the scientific enterprise itself. If there is no science of learning, then there is much less a science of teaching; if we are dealing with a young and sprawling field of inquiry in which many divergent interests and conflicting theories lead in various directions through mountainous and ever-increasing accumulations of experimental evidence, which is surely the case, can we reasonably expect teachers to become truly conversant with and proficient in the use of psychological theories that underlie practice and experimentation in the classroom? I think we must try to produce this result, even though presently we may not always be fully confident of success. Some measures that might improve the chances of success will be mentioned later.

Cronbach has commented on the need for theoretical understanding in his own text on educational psychology. "To obtain new designs in education, it is not enough to proceed by trial and error. Trying one method after another and observing how much pupils learn under each method can lead in time to superior teaching procedures.--But theory and principle hasten invention. Trial and error has less error in it when new proposals spring from understanding."[17] We are living in a period when more and more teachers are becoming involved in experimental programs and innovation, sometimes as co-planners, sometimes merely as cooperative participants. Their effectiveness in experimental procedures as well as ordinary teaching will be limited if they do not have adequate theoretical perspective to see beyond immediate empirical results.

What theoretical background is required for audiovisual teacher competencies? It would seem reasonable to assume that all teachers should know something about learning theory and that training for the use of media should include pertinent and specific applications of theory and research findings to audiovisual procedures. What this might entail will be discussed in broad outline next. Further assumptions regarding the place of perception theory, communication theory, and philosophic perspective will also be discussed, each in its turn.

With respect to learning theory in general, it would be easy to say that all teachers should be conversant with all the theoretical positions and theorists who have had important impact on psychological literature and research, but it would be difficult to validate that statement, let alone to identify the theories that ought to be included. A number of years ago, Hilgard published a book entitled Theories of Learning. Edna Heidbreder published a similar book called Seven Theories of Learning. Since then, major changes have taken place in the climate of theoretical discussion. There is less talk of conflicting, discrete theoretical positions, more about divergent emphases and interests. Despite the deep cleavages that still exist, there has been less debating and more attention given to internal refinements of prior theoretical structures. By and large, the modern versions of classical S-R theory have retained their dominance over the field of experimental psychology and even expanded their influence by virtue of the fact that some psychologists working in the mainstream of the S-R tradition are seeking formulations better adapted to deal with broader segments of behavior or with concerns more nearly related to cognitive theory. Mowrer's book Learning Theory and Symbolic Processes is a case in point.[18] Also within the classical S-R framework is the trend toward a greater use of mathematical models of learning, as shown in the work of Estes and others.

However, there is still a vocal minority group of psychologists who favor the notion that S-R theory is fundamentally restrictive in its approach to the study of human behavior and that more complicated models, such as the "feedback loop," are necessary to simulate the complexities of human behavior and learning. The recent book by Miller, Galanter, and Pribram, Human Plans, Purposes and Strategies, is a case in point.[19] And of course there is also a large group of psychologists and educational psychologists which is focally concerned with personality theory and its widely remifying implications for the art of teaching.

Finally, by way of additional contrast, recent developments in the study of chemical, physiological, and neurological aspects of learning offer some interesting new facts and raise some provocative questions regarding some of the more traditional theories.

Should we expect the classroom teacher to be in complete possession of the whole story of modern psychological doctrine? Probably not. But he should know enough about the historical development of the science and the modern versions of S-R theory, cognitive theory, and personality theory so that he is able to weigh their respective contributions and thus maintain some balance of perspective as he deals with problems of research or practice in the classroom. As a prospective user of audiovisual media and materials he should be aware of the dominance of classical S-R theory in experimental psychology and also its critical role in the development of programed instruction, especially as related to the Skinnerian concept of instrumental conditioning. On the other hand, he should be equally cognizant of the reservations, the fears, and the mistrust that are prompted by certain elements in personality theory and cognitive theory when psychologists or teachers holding such views are confronted with the prospect of automated teaching procedures. Frequently, teachers seem to have a kind of partisan loyalty to a restrictive set of psychological assumptions which tends to limit the range of responses they can try in a given instructional situation. Hopefully, a better and wider understanding of psychological theory would improve their effectiveness by adding flexibility and versatility to their instructional techniques.

Specific applications of learning theory to the audiovisual functions of teaching beyond the broad considerations already mentioned are not easy to identify. Two special issues of Audiovisual Communication Review have dealt with this problem. In the 1957 publication, Graphic Communication and the Crisis in Education, Neal Miller showed how principles derived from his version of S-R psychology could be applied to the use of motion pictures in teaching.[20] In a later special issue, edited by Meierhenry, papers prepared by a group of psychologists dealt with the audiovisual implications of learning theory from various points of view.[21] Both publications provide a rich source of ideas for research and further analysis, but they leave the clear impression that there is, as yet, no fully developed or widely accepted theory of learning as applied to audiovisual instruction. This is not to say that research workers and teachers have nothing to go on in this area. On the contrary, Glaser, in the issue on learning theory, argues that we have important and reliable research findings, empirical evidence, which ought to be applied to practice, that this may be more fruitful than the application of theory at present.[22] Whether his position and suggestions are actually as "atheoretical" as he claims is debatable. Be that as it may, other papers in the same publication do offer some avowedly theoretical applications, but the extent to which these constitute specific principles of audiovisual utilization is left in considerable doubt. McDonald, for instance, states that "content presentation via film, lecture, or book is essentially the same process, and we ought to expect the relations of this presentation to characteristics of the recipient to be similar across media."[23]

Postman goes even further as he notes that "the analysis of the process of audiovisual education does not call for the formulation of special principles; it calls for the application and elaboration of the general laws of learning," a point which is approvingly emphasized as a "motto for research upon audiovisual devices" in Deese's summary paper.[25]

b. Other theoretical aspects. Postman's thesis that the analysis of audiovisual instruction does not call for the formulation of special principles is a very good example of a statement that may be true "as far as it goes." To be explicit, Postman was discussing learning theory when he made the statement, but was he speaking as a psychologist or merely a learning theorist? It makes a difference. Analysis of the audiovisual instructional process requires learning theory, to be sure, and maybe just the application and elaboration of "general laws" is good enough, but is that all the analysis requires?

Audiovisual instruction involves the presentation of information. A basic assumption underlying the use of audiovisual materials or techniques is that the character or form of the information presented makes some difference in the result. The idea that concrete instructional materials serve a peculiar and useful function in instruction and/or communication is one of the basic, if not the basic, assumption underlying audiovisual education. Hoban, Hoban, and Zisman identified this assumption and highlighted its central theoretical importance in one of the earliest audiovisual textbooks, and the same notion has resounded in the audiovisual literature ever since, although, curiously, it has never become a subject for thorough analysis until quite recently when Knowlton, Travers, and a few others have begun rather specific theoretical and experimental studies.[26] Both general and educational psychologists have tended to ignore this matter or to discount its importance. In the case of one prominent exception, the investigator has recently recognized the problem of the "concrete" factor in instructional communication, but the results of his research have led him to question seriously the value of the concrete, particularly when used in bi-modal or two-channel presentations, such as the sound motion picture.[27]

In sum, the audiovisual instructional process is a problem in learning, but it is also a problem in the presentation of instructional materials: as Travers puts it, "the transmission of information to human receivers."[28] Thus, the theoretical background should be drawn from learning theory but also from communication theory and perception theory, at least, and the mediation of this dialogue probably ought to be philosophic rather than oriented to any specific discipline.

It seems to this writer that prospective teachers as prospective users of audiovisual materials need to have at least a broad introduction to communication theory and perception theory in addition to their orientation in the field of learning. As a result of this instruction teachers ought to have sufficient grounding in the basic literature of social psychology, information theory, communication models, and some of the representative philosophic and psychological literature of perception theory so that they can read current theoretical discussions and research reports, interpret the commonly used jargon, and bring increased understanding and perspective to bear upon their own practices, the experimental programs in which they may become involved, or the proposals of innovators. The grounds for the statement just made are purely speculative and without the support of a scrap of experimental evidence. Moreover, the writer sees no ready way to resolve the question of the proper training of teachers for audiovisual competencies on experimental grounds. Since we must settle for a proposed solution that is merely logical and speculative, it would seem best to be satisfied with rather general specifications of the type already given and leave the details until there has been some opportunity for discussion of the assumptions and broad recommendations given in this paper.

IV. Some Curricular Implications

Some final comments on the subject of implementation may be in order. They may also serve the purpose of giving sharper definition as well as further justification of some of the elements proposed for the audiovisual training of teachers. It is readily apparent that most teachers entering the profession today do not encounter a pattern of instruction that would satisfy all the demands suggested or implied by this paper. Some of the requisite instruction is provided, in varying amounts, in audiovisual courses (when offered and/or required), in courses in educational psychology or other foundations and methods courses in the professional sequence, and in the general education program. As already indicated, the audiovisual course is ordinarily very sketchy, if not superficial, in its coverage of theoretical aspects. If current trends in textbook content are any indication, present courses in educational psychology are giving more attention to the subject of learning,[29] and at least one current text in wide use devotes a chapter to the subject of "Communicating Knowledge."[30] Also, some foundations courses note the growth of modern technology and its impact on education, but the situation, by and large, is that teacher education, generally, simply does not provide the breadth and depth of theoretical orientation that would ensure a truly professional and scientific approach to the use of instructional media. Moreover, there is the hard fact that any attempt to expand existing course offerings in the directions indicated by this paper must compete with other strong interests that seek representation in a crowded and in some cases recently compressed curriculum. The problem becomes even more difficult if we seek to go all the way back to general education courses, although this, theoretically, is surely the place to begin.

The reason for improving the theoretical training of teachers with respect to their use of media or any other aspect of instructional procedure is to widen their perspective and to free them from the constraint of the merely traditional, the narrowly empirical, or the blindly emotional--in other words, to liberalize their professional training. Some of the current trends in teacher education seem to have created the curious risk that a too narrowly conceived emphasis on liberal education and content without regard to their bearing upon the professional sequence may actually interfere with the liberalization of the professional education of teachers.

The traditional Aristotelian notion that liberal education is education for leisure, to be contrasted against education for use, still lingers somewhat amidst the ivy-covered walls. This and the allied preoccupation with certain traditional "liberal arts" and with the classical literature of the past as constituting exclusively _the_ content of liberal education may tend to produce a kind of intellectual isolation from occupational interests and from current realities resulting in just the opposite of a liberalizing effect. The payoff of a liberal education is not just the quiet enjoyment of some special domain of knowledge, wisdom, and art; not merely the cultivation of intellectual power or some ability to think, in the abstract. The payoff is all of these things, but it is also, and ultimately, the perspective, the depth of understanding, and the humanity that man brings to the gritty substance of his everyday life and work. Without this ultimate fruition, the whole process of liberal education is a failure which tends to degenerate into a futile attempt to find lasting serenity and certainty by retreating to the past.

It is a mistake to confuse liberal education with general education and doubly an error to assume that any and all professional education is by definition non-liberal in function. "Liberal," as Borrowman has suggested, refers to the function of an educative experience, not merely to some administrative arrangement or segment of the curriculum.[31]

The upshot of the foregoing digression is that the education of teachers ought to be liberal and liberating throughout both the general and professional segments of the program. In the case of professional training for the use of media, it might seem unrealistic or farfetched to say that the general education program should provide a suitable foundation not only in psychology but in social psychology, anthropology, philosophy, and some of the recent developments in linguistics, semantics, and modern communication theory. However, such a foundation in general education courses would be good not only for teachers but for the countless others whose occupational functions entail communication and/or instructional skills related to the use of modern instruments of communication. The core of the general education sequence could and often does provide a good deal of this, and at least some of the other elements could be included as elective subjects in the programs of prospective teachers. If students entering the professional sequence were thus prepared, educational psychology courses might well devote more attention to perception theory and to communication theory as related to the instructional-learning process. The results here, as also in the case of instruction in learning theory, would perhaps be best if the student were exposed to a representative range of points of view and made aware of the variety of research interests and styles.

Finally, there is the question of theoretical content in the audiovisual courses per se. We have already indicated that textbooks are often very sketchy, if not superficial, in this respect and have given some of the reasons why such is the case. Audiovisual courses ought to contain more and better theoretical content of the sort already described not only for reasons earlier cited but also because of the growing professional maturity, scholarship, and scientific stature of the field. Many teachers in training, perhaps the vast majority, are not required to take a course in instructional technology, educational media, instructional communication, or whatever it may be called. But there are some indications that such courses represent an area of increasing interest in the literature and to some extent in the curricula of teacher training institutions. If the instructional media course can be improved in its theoretical and other aspects, this alone could help to further sensitize those who teach other professional courses to the importance and manifold dimensions of the task of effectively utilizing the modern technology of communication in education. Hopefully and in time, it may even become apparent that teacher competencies in this area as in many other professional functions that involve such a fundamental social process as communication have their roots deep in the general education program. As this paper has already argued, the test of a truly liberal general education is whether its supposedly liberating effects are ultimately realized in the life and work of the educated person.

FOOTNOTES

1. James Bryant Conant, The Education of American Teachers (New York: McGraw-Hill Book Co., 1963), p. 120.

2. Ibid., p. 122.

3. Ibid., p. 121

4. Ibid., p. 127.

5. Professional Imperatives: Expertness and Self-Determination, Report of the National Commission on Teacher Education and Professional Standards of the National Education Association, Fort Collins, Colorado, 1962 (Washington, D. C., 1962), p. 45.

6. Conant, p. 143.

7. Kenneth Norberg, "The Place of Learning Theory in the Graduate Training of Audiovisual Communication Specialists," in The Training of Audiovisual Communication Specialists, ed. Robert Hall, U. S. Office of Education Contract. (Alameda, California: Alameda State College, 1964).

8. Ernest R. Hilgard, "Learning Theory and Its Applications", in New Teaching Aids for the American Classroom, ed. Wilbur Schramm (Stanford, California: Institute for Communication Research, 1960), pp. 24-25.

9. Conant, p. 26.

10. Elizabeth Goudy Noel and J. Paul Leonard, Foundations for Teacher Education in Audio-Visual Education (Washington, D. C.: American Council on Education, 1947), pp. 5-6.

11. W. R. Fulton and Frederick A. White, "What Constitutes Teacher Competence in Audio-Visual Communication?" Phi Delta Kappan, XL (1959), 159.

12. Conant, p. 138.

13. Conant, p. 140.

14. See G. M. Torkelson, An Experimental Study of Patterns for Improving the Preparation of Pre-Service Teachers in the Use of Audiovisual Materials and Effects on Pupils, National Defense Education Act Title VII Project No. 079m, Grant No. 7-48-0720-034 (University Park, Pennsylvania: The Pennsylvania State University, 1965).

15. Alvin Eurich in Teacher Education: A Reappraisal, ed. Elmer R. Smith (New York: Harper and Row, 1962), p. 198.

16. James W. Brown and Kenneth D. Norberg, Administering Educational Media (New York: McGraw-Hill Book Co., 1965), p. 66

17. Lee J. Cronbach, Educational Psychology (2nd ed.; New York: Harcourt, Brace and World, 1963), p. 4.

18. O. Hobart Mowrer, Learning Theory and the Symbolic Processes (New York: John Wiley and Sons, Inc., 1960).

19. G. A. Miller, E. Galanter, and K. H. Pribram, Human Plans, Purposes & Strategies, (New York: Henry Holt and Company, 1960).

20. Neal E. Miller, in Graphic Communication and the Crisis in Education, special issue of Audiovisual Communication Review, V, No. 3 (1957).

21. Learning Theory and AV Utilization, ed. Wesley C. Meierhenry, special issue of Audiovisual Communication Review, IX, No. 5 (1961).

22. See Glaser, in Learning Theory and AV Utilization, p. 43.

23. See McDonald, in Learning Theory and AV Utilization, p. 61.

24. See Postman, in Learning Theory and AV Utilization, p. 78.

25. See Deese, in Learning Theory and AV Utilization, p. 86.

26. C. F. Hoban, C. F. Hoban, Jr., and S. B. Zisman, Visualizing the Curriculum (New York: Dryden Press, 1937); James Q. Knowlton, A Socio- and Psycho-Linguistic Theory of Pictorial Communication, U. S. Office of Education Contract No. 3-16-019 (Bloomington, Indiana: Division of Educational Media and Audio-Visual Center, Indiana University, 1964); Research and Theory Related to Audiovisual Information Transmission, ed. Robert M. W. Travers, U. S. Office of Education Contract No. 3-20-003, Interim Report (Salt Lake City, Utah: Bureau of Educational Research, University of Utah, 1964).

27. See Travers, ed. in Research and Theory Related to Audiovisual Information Transmission.

28. See Travers, ed., Research and Theory Related to Audiovisual Information Transmission.

29. See Derek N. Nunney, "Trands in the Content of Educational Psychology, 1948-1963." Journal of Teacher Education, XV (1964), 372-377.

30. Cronbach, Educational Psychology.

31. Merle L. Borrowman, The Liberal and Technical in Teacher Education (New York: Bureau of Publications, Teachers College, Columbia University, 1956.

CHAPTER IV

EDITOR'S COMMENT ON GERLACH'S PAPER

The Gerlach paper develops an approach to learner-response oriented instruction. What we find in this paper is a micro-approach to the teaching-learning act as contrasted with the micro-approach which is embodied in systems developments. What Gerlach attempts to show is the way in which each specific behavioral objective can be approached initially by the way of learning strategies.

Gerlach contrasts and clarifies the differences between stimulus-oriented materials and response-oriented materials. He suggests that most teachers and most media are stimulus-oriented (Gropper has also been emphasizing this point in recent writings) rather than response-oriented. Therefore, it is evident that he comes to grips with the basic problem involved in the new approach to a greater degree than any of the other writers of position papers.

The reader should be forewarned that he will encounter language which may be foreign to him. Such terms as stimulus response and reinforcement, are psychological terms. It should be indicated, however, that these are exactly the same terms which Norberg suggests all educators should be familiar with. Further, they are so much a part of the new approach to teaching and learning that they and others should be well understood by any one working in the field of education.

It has been suggested that it may have been more appropriate to have used some other illustrations. Probably the most serious objection is to the mathematics example, which forms the basis for much of what Gerlach has to present. The type of mathematics which he "programs" is really traditional mathematics rather than new math. It is a type of mathematics which some mathematicians feel should not be taught at all any more. Another and less serious objection to the mathematics case study is that Gerlach probably misplaces it in terms of where it would be taught traditionally.

It might have been worthwhile to have included also an example from a field where it is not quite so easy to anticipate in advance what each response should be. Many persons are convinced that what Gerlach proposes can be done, although not so easily, in such fields as the social sciences, the fine arts, and the humanities. It would have been interesting, for example, for one of the case studies to have dealt with the teaching of patriotism or the appreciation of poetry.

In spite of these comments, the editor believes that Gerlach has presented a model which permits us to develop a student-centered, response-oriented system with greater hope of success than any other model in the literature thus far.

SELECTING AN INSTRUCTIONAL MEDIUM

Vernon S. Gerlach*

Can a model or set of criteria be developed for assisting a teacher to select a medium from among several media which will help to meet a specific instructional objective?

The typical textbook in audiovisual materials and procedures presents an impressive list of media from which to make such a selection and an equally impressive list of media characteristics on which to base the selection. In reality, however, even superior teachers seldom employ textbook procedures in the selection process.

To begin with, we need to clarify the definition of the term new media. Though it may be true that this term, to use the words of the Definition and Terminology Commission, has "not been widely accepted," it is certainly true that the term is widely used. Cursory examination of a few textbooks and selected papers indicates that the term new media has been used to include all of the following with varying degrees of frequency:

Field Trips
Mock-Ups
Models
Objects
Specimens
Chalkboard
Displays
Bulletin Boards
Posters
Television Broadcasts
Diagrams, Charts, & Graphs

Motion Pictures
Still Pictures--non-projected
Filmstrips
Slides
Still Pictures--opaque projected
                        overhead projected
Radio Broadcasts
Phonograph Recordings
Rape Recordings--sound
Tape Recordings--video
Programmed Instruction

---

*Associate Professor of Education, Arizona State University, Tempe, Arizona

Either there is a vagueness about the term _new_ _media_, or there is a generality about it that makes its usefulness minimal because of its all-inclusiveness.

Think of the term _dwelling_ and cast it into a situation analogous to that of _new_ _media_. Someone asks for a scheme or set of criteria for selecting a dwelling. What are the parameters of the population of dwellings from which we are to select? Will our list include apartments? hotels? campers? tents? igloos? stables? What is of critical importance to the person doing the selecting? Certainly the characteristics of the future inhabitant must be considered. Pygmies of the jungle have requirements different from those of the people whose names appear in the Social Register. Equally important is the matter of availability. Given an individual who has an income of $10,000, a wife and two children, and a job in Phoenix, we would find the dwelling-selection process somewhat simplified. Igloos just won't do. Change the location and apartments or hotels may disappear from the list not because they are unsuitable but because they are unavailable. Even more important, however, is the purpose for which the dwelling is intended. If we include facilities for selling stock, for repairing airplanes, and for housing crap tables and roulette wheels under the broader definition of the term dwelling, the list of types could conceivably grow to the magnitude of the list of new media. At any rate, the characteristics of the inhabitant and the use for which the dwelling is intended are determiners of dwelling types. Media selection, too, ought to be dependent upon a list of specific determiners.

To return to the original question, then: Can a model or set of criteria be designed for assisting a teacher to select a medium from among several media? In answer to this question, we will consider the following topics:

1. the traditional method of media selection is, in the main, entirely stimulus-oriented; and
2. a response-oriented approach to media selection offers an alternative scheme which is both simple and effective.

The discussion of these two topics is based upon three defining assumptions:

1. teachers are paid to influence a pupil to learn;
2. the means which a teacher uses and the situation in which they are used to bring about this learning constitute the instructional system; and
3. the most applicable principles for the design of an instructional system are to be found in the principles of task analysis.

I. A Traditional Approach to Media Selection

Typically, teachers don't select a medium. They don't analyze the learning task in terms of stimuli upon which desired responses are to be made contingent, and they don't match characteristics of these stimuli with the medium most amenable to the type of stimulus presentation indicated by the learning task. Instead, the teacher selects an instructional instrument.

The average teacher turns to a catalog or manual where he finds, at best, vague descriptions of the instrument's stimulus characteristics.

"Old and New India. Film discusses religion, women's place in society, climate and clothing, the use of work animals, transportation, handicrafts, farm crops, and cities." (From a university film library catalog).

"The Decline of Rome. The rule of the Caesars and the Roman Empire crumble together." (Description of a tape recording from a teacher's manual)

"Graphing Inequalities. This drawing can be used in the study of the graphing of inequalities. The graph of $X + Y = 10$ is shown as a line of dashes." (Description, not illustrated, of an overhead transparency from a commercial catalog)

For what learning task is each of these examples of media suited? Obviously, the teacher needs to know considerably more about each of the instruments in order to make an intelligent decision. But the problem is more than one of quantity of information; no catalog or teacher's manual can tell everything about a given instrument. Instead of depending solely on a catalog description, teachers supposedly "preview" an instrument before using it in class. The description in the catalog or manual serves, at best, only as a screening device in the selection process and then only after a decision has been made regarding which medium to use.

There remains, however, the dimension of quality. The description of the stimulus characteristics of an instrument can be useful, if ever, only after the teacher has analyzed the instructional task.

Consider this description of an instrument:

"Cells: Their Structure and Function. . . students are able to identify and label the parts of a generalized plant or animal cell." (Description of a programmed text from its accompanying teacher's manual) In this example the teacher supposedly has decided what outcomes are desired. If "identifying and labeling parts of a plant or animal" is one of these behaviors, this instrument deserves a closer look. Whether or not it ultimately will be used may depend upon the entering behaviors of the pupils: do they have sufficient background to begin where this instrument starts them? can they read the material? is the length of time required for completion compatible with the teacher's schedule? Or it may depend upon other considerations. At the moment, these matters are of secondary importance. Of prime importance is the fact that since this is a response-oriented instrument, it is described in terms of an observable operation which pupils can be expected to perform under specified conditions after using it.

The description of the stimulus-oriented instrument, on the other hand, emphasizes the stimulus content of the instrument. If the last example cited were stimulus-oriented, it might be described something like this:

"Cells: Their Structure and Function. . . Shows the structure of typical plant and animal cells. Terms such as cell, membrane, nucleus, cytoplasm are explained by means of pictures and drawings." Nothing is said about what effect this instrument may have upon the learner's behavior.

The entire emphasis is placed upon describing the characteristics of the instrument as a stimulus, to the complete exclusion of any attention to the learner's response. Even items of secondary importance, such as those mentioned above, are rarely included in a description of a stimulus-oriented instrument.

A stimulus-oriented instrument, however, is not necessarily "bad." It is entirely possible that a teacher who arranges specific contingencies properly may use a stimulus-oriented instrument to shape desired behavior. However, this is not a result of the design of the instrument, but rather a function of careful utilization of the instrument by a teacher who knows the ingredients essential to controlling the learning process. In other words, a teacher who employs response-oriented media selection procedures may use almost any kind of instrument effectively, given the kinds of conditions described below.

II. A Response-Oriented Approach to Media Selection

What factors control pupil behavior in a classroom? Whatever they are, and however many they may be, all can be classified in one of two categories: internal stimulus controls and external stimulus controls. Internal stimulus controls are those which are internal to the instrument itself. A good self-instructional loop film, for example, may have sufficient power to enable a learner to acquire and maintain responses that were not in his repertoire; or it may bring previously existing responses under the control of new stimuli. No matter which, the important distinction is the fact that it is the instrument, apart from the teacher, which controls the learner's responding behavior.

Many motion picture films, to use one example, are so constructed that there is little or no internal stimulus control over the pupil's responses. The effect this type of instrument may have on learner behavior is completely dependent upon the context in which it is used. In other words, the stimulus control is external to the instrument; the control lies in the instructional procedures of the teacher who determines what responses, if any, the pupils make to the motion picture.

The distinction is not one in which programmed texts are equated with internal control and all other media with external control. Not all audio-visual aids are devoid of internal controls, nor are teaching machines and programmed instruction always designed to be used without any external control. On the contrary, a teacher may use a programmed text in a context which involves a considerable amount of external stimulus control. For example, the teacher may tell the class to complete the first fifty frames and then take a test. If the rules of the game are such that those pupils who pass the test go on with frame fifty-one and those who fail the test return for a second attempt on frames one to fifty, the teacher is exerting a substantial degree of external control. If the teacher permits those who do work of a certain quality to leave for recess as soon as they have finished a set of frames, the teacher is using another kind of external control. If the teacher keeps after school those pupils who disturbed their classmates during the time the programmed textbook was being used, a third kind of external control is present. Obviously, nearly all teacher-pupil situations are characterized by some degree of both kinds of stimulus control. For example, the instructional material which the teacher has selected may exercise a considerable degree of (internal) control over the quality of the responses which the learner makes. On the other hand, at the same time the teacher may exercise a high degree of (external) control with respect to the quantity of responses which the learner makes during a unit of time; that is, he may control the extent to which the learner engages in "responding" behavior or "looking-out-the-window" behavior. Or the teacher may ask questions which govern pupil responses, thereby adding a dimension of "quality control" which is external.

It is also possible that a motion picture film, for example, may be designed to provide most of the stimulus control over those responses which are necessary to the learning of a given task. Several such films have been produced by the author for use in teaching equipment operation skills in a self-instructional audiovisual laboratory. The external controls operating in this situation are, apparently, nothing more than the course grade-laboratory performance contingency. The point to be emphasized here is that there is nothing inherent in any single medium which makes it amenable to a high degree of internal control. Instead, it is the manner in which the specific instrument is designed that determines whether control is primarily internal or not.

Obviously, instances in which learner behavior is completely under the internal control of an instructional instrument are the exception in present-day classroom instruction. The teacher, therefore, must operate with an instructional system which allows for varying degrees of internal and external control. More important, however, is the decision concerning the degree and the nature of the control. How much is the teacher expecting of the medium? How much is the teacher going to do himself? To what extent are the teacher and the medium going to share the instructional load? If the teacher wants the medium to do it all, he must select a medium which has the potential of high internal control with minimal need of external control over pupil responses. If the teacher merely wants an "audiovisual aid," he will see to it that the medium is of such a nature that it will permit the teacher to travel quickly and easily that route which the responses of the learner indicate he should take.

III. How to Know the Task.

Thus far, we have oversimplified all our problems by asserting that an effective instructional system must be predicated upon a systematic task analysis: the objectives or the desired terminal behavior must be stated in operational terms. A review of what has been said and written about objectives reveals a high degree of agreement on the necessity for stating them in such terms. The body of literature which describes the characteristics of behavioral objectives is substantially less. A few, such as Mager and Lindvall,[1] go so far as to tell the learner how to distinguish a behavioral objective from any other kind. But specifications for writing such objectives are another matter; though nearly everyone says "Do it," no one explains how to do it.

First of all, the objectives must be descriptions of behavior. No one can even begin to assess the effect of an instructional variable, such as a motion picture film or a field trip, unless he can describe the behavior of interest. It is the learner behavior that is to be measured; it is the measurable changes in the learner behavior that tell us whether or not learning has taken place.

This behavior must be described in operational terms. This means that observable performances of the learner must be described in terms such that the teacher or any competent observer will discriminate between those learners who exhibit the behavior of interest and those who do not. The language is functional in this context when a group of competent observers exhibits a high degree of inter-rater reliability, given a description of a set of events that constitutes an example of the behavior of interest and given a learner who is performing a task which reflects this behavior. The Classroom Learning Laboratory at Arizona State University has developed a set of action words to meet the needs which it has encountered in developing instructional materials. Table 1 contains a selected list of this type of word and definition.

A specification of instructional objectives in language of the kind described above is a necessary condition for developing an effective instructional system. But this is far from enough. A few writers of programmed textbooks, to cite only one example, have written excellent specifications of objectives, but their programs have not produced the desired learner behavior. Why? Simply because it is not true, Mager to

Table 1

Behavior Descriptions

(These behavior descriptions are used in the examples cited in this paper and constitute only a partial list of action words employed in research conducted by the Classroom Learning Laboratory, Arizona State University.)

Identifying - The learner indicates membership or non-membership of specified objects or events in a single class when the name of that class is specified.

Examples: 1. On the map before you, is "X" a peninsula?
a. yes b. no

2. Which is a peninsula? a. X b. Y c. Z

The learner may respond to the examples above by writing or underlining the correct response or by pointing, touching, speaking, etc.

Classifying - The learner indicates the class membership of specified referents belonging to one of two or more classes whose names are specified. The referents to be classified must include exemplars from at least two of the specified classes.

Examples: 1. For each word write (or say) 'noun', 'pronoun', or 'neither'.

a. them b. is c. radio d. car e. when

2. Write the part of speech of each word in the sentence below. (A list of the parts of speech would be given with this item.)

The big black dog was barking loudly at the prowler.

Naming - The learner supplies the correct verbal response (in speech or writing) to a referent or set of referents when the referent names are not specified.

Examples: 1. What part of speech is the word 'mouse'?

2. Write the part of speech of each word below. (No list of parts of speech is supplied.)

Table 1 - Con't.

a. cat b. frog c. and d. Gosh! e. quickly

Ordering - The learner arranges two or more referents in the proper order specified in instructions to the learner. The learner may be required to name the referents himself, or a list of referents may be provided for him.

Examples: 1. Arrange these events in the order that they occurred:
- a. James I becomes King of England.
- b. The death of Queen Elizabeth I.
- c. The defeat of the Spanish Armada.
- d. The death of Mary, Queen of Scots.
- e. First English colony in America founded.

2. Name in order the four things you should do to cross the street safely.

The first example above is an instance in which the learner simply arranges in order a given list of referents. In Example 2 he must both name and order the referents.

Stating a rule - The learner states or writes a rule, principle or formula verbatim or in such a way that he specifies in their proper order the object and event referents, the relationships, and the operations included in the rule.

Examples: 1. What is the rule for computing the speed of a freely falling body?

2. How is the speed of a freely falling body constructed?

Applying a rule - The learner makes a correct identifying, classifying, naming, or ordering response to a question which can be correctly answered through the use of an acquired (i.e., previously stated by the learner) rule. In this behavior the learner is not required to show or tell how he arrived at his answer, so actual use of the stated rule is not observable. The examples below show how each of four different behaviors could be elicited in the application of a rule.

Examples: 1. (Identifying) What is the speed of a freely falling object two seconds after its release?

a. 32' per second b. 48' per second
c. 64' per second d. 80' per second
e. 96' per second

Table 1 - Con't.

2. (Classifying) Match the speeds listed with the falling objects shown in the diagram. (Here a diagram showing objects falling for differing lengths of time would be presented to be matched with a list of correct speeds for the various objects.)

3. (Naming) What is the speed of a freely falling object three seconds after its release?

4. (Ordering) List the objects shown in the diagram in the order of their speed of descent. (This would require an accompanying diagram showing two or more objects falling from different heights.)

the contrary notwithstanding, that "If you give each learner a copy of your objectives, you may not have to do much else."[2] The statement of objectives must be followed by a specification of the sequence and arrangement of the instructional stimuli upon which the desired behavior is contingent. Researchers in the Classroom Learning Laboratory, faced with the problem of developing a high degree of internal control in the instructional materials, have used a paradigm called the Instructional Specification (IS) to develop this fine-grain specification of stimulus conditions.[3] Each IS contains specifications for one set of behavior and its accompanying stimulus conditions. In the classroom context, a subject such as third-grade science or high school geometry would consist of a series of IS's arranged in sequence designed for maximum developmental progression. Though intended originally as an aid in the writing of a programmed textbook, the IS has provided a procedure for developing such widely differing instructional materials as motion picture films and Air Force technical manuals.

To illustrate the extent to which specification of stimulus conditions and selection of an instructional instrument are related, I shall illustrate, step by step, the development of an IS.

The instructional unit is entitled "Addition and Subtraction of Common Fractions." This unit is commonly taught in fifth grade. The kinds of behavior with which this unit is concerned might include all of those listed in Table 2.

Take objective number 5: "Identify and name a proper fraction." To begin with, we want the learner to select the correct exemplar (by pointing,

Table 2

The set of student behaviors to be developed in a unit on addition and subtraction of common fractions.

---

1. Identify, distinguish between, and name fractions and whole numbers presented semantically, figurally, and symbolically.
2. Name the top number in a fraction the numerator.
3. Name the bottom number in a fraction the denominator.
4. Classify numerators and denominators.
5. Identify and name a proper fraction.
6. Identify an improper fraction.
7. Classify and name proper and improper fractions.
8. Identify a mixed number.
9. State and apply the rule for adding like fractions whose sum requires no reducing and is less than 1.
10. State and apply the rule for subtracting like fractions whose remainder requires no reducing and is less than 1.
11. State and apply the rule for adding a whole number and a mixed number.
12. State and apply the rule for subtracting a whole number and a mixed number.
13. State and apply the rule for subtracting minuends and/or subtrahends that are identical.
14. Name the numerator and denominator of fractions terms.
15. State and apply the rule for changing fractions from lower to higher terms.
16. Order fractions according to their magnitude.
17. State and apply the rule for changing whole numbers to improper fractions.

Table 2 - Con't.

18. State and apply the rule for changing mixed numbers to improper fractions.

19. State and apply the rule for the decomposition of a fraction.

20. State and apply the rule for the decomposition of the minuend of a a subtraction problem when the minuend is a mixed number.

21. State and apply the rule for subtracting like fractions involving decomposition.

touching, or underlining or by any other appropriate behavior) of a proper fraction in response to the eliciting stimulus "Which is a proper fraction?" In addition, we want him to supply the correct name, given any exemplar of the class "proper fraction" and an eliciting stimulus, such as "What is this called?"

Before the learner can emit the desired behavior in the present task, he must be supplied with some kind of discriminative stimulus which he can use to mediate this behavior. For example, in teaching the learner to identify and name proper fractions, we can point out one simple and foolproof way of describing a proper fraction: the numerator of a proper fraction is always smaller than the denominator. Given this discriminative stimulus, the learner should be able to make a valid decision concerning any fraction. This stimulus which serves to mediate the behavior of interest is called the instructional cue. Instructional cues should be stated in pupil vocabulary in the IS so that they can be used later in the instructional instrument with little modification. Instructional cues, then, are discriminative verbal statements which serve to mediate the verbal or nonverbal responses called for in the IS objectives.

However, the teacher needs some assurance that the instructional cues are functioning as desired. Thus, having decided upon the precise nature of the response of interest, the teacher will list all those classes of stimuli which can be used to elicit the desired responses from the learner. These eliciting cues may appear in a variety of forms, bu since nearly all of school learning is either verbal or at least verbally mediated, the eliciting cues will most frequently be words.

The eliciting cues for the IS under consideration would look like this:

1. Is the numerator smaller than the denominator? 2/3, 8/3, etc.
2. In which of these fractions is the numerator smaller than the denominator? 5/3, 3/4, 1/1, 2/1, 7/4, etc.
3. Is this a proper fraction? 3/4, etc.
4. Which is a proper fraction? 7, 2/3, 5/4, 12/5, etc.
5. If you put a 3 in the blank, would you have a proper fraction?

   $\frac{(\underline{\quad})}{5}$, etc.
6. What is this type of fraction called? 1/2, etc. __________

The eliciting cues should be sequenced in the IS in such a way that those presented first require the learner to make lower-level discriminations, while those presented subsequently require progressively more complex discriminations. For example, the instructional cue in our example will not enable the learner to identify and name proper fractions if the learner is unable to identify those fractions in which the numerator is smaller than the denominator. Thus, our first two eliciting cues are designed to insure that the learner can in fact identify fractions in which the numerator is smaller. Only after the learner has demonstrated this ability would our instructional cue be introduced. Following the presentation of the instructional cue, we would present the eliciting cues (in this case, several exemplars from cue 3 above followed by examples from the subsequent cues) which require the learner to demonstrate that the information presented in the instructional cue is controlling the desired behavior.

The eliciting cues are generic in that it is often possible in an instructional sequence to generate several specific cues from a single cue listed in the IS. For example, the third eliciting cue above might appear in the instructional sequence in any or all of these forms:

3/4 is a proper fraction.   Yes   No

3/4 (is, is not) a proper fraction.

Is 3/4 a proper fraction? ________

3/4 is not a proper fraction.   T   F

Finally, the IS specifies the population boundaries of the members of the stimulus class which will control the response of interest. It is necessary to specify both those stimuli to which the response will become attached (S^D's) and stimuli having similar characteristics to the S^D's but serving as improper stimuli for the response of interest (S^{Δ}'s). This is true because the learner must, among other things, (1) make the desired response in the presence of the proper stimuli and (2) refrain from making the response in the presence of the improper stimuli.

Discriminative stimuli are of two types: S^D and S^{Δ}. Take, for example, your telephone. Your ring is one long, while the ring of the other party on your line is two shorts. When you hear one long, you answer the telephone. The behavior of interest is to answer the phone, and the S^D for this response is a one long ring. You do not answer the phone when you hear two shorts. Two shorts is an S^{Δ} for the response to answer the phone. Niether do you answer the phone when it is not ringing. In other words, silence, i.e., non-ringing, is an S^{Δ} for the response of interest. In this example, we have a finite number of S^D's and S^Δ's: one of the former and two of the latter. For some responses, there may be only one S^Δ and one S^D. Other responses may be under the control of several or many S^D's. Likewise, the number of S^Δ's for some responses may be infinite.

The population boundaries or limits for the IS for proper fractions would include a number of restrictions. In the example above, the proper stimuli (S^D's) for "proper fraction" are all fractions in which the numerator is smaller than the denominator. The S^Δ's, or those stimuli serving as improper ones for the desired response, are all fractions in which the numerator is as large as or larger than the denominator, all mixed numbers, and all whole numbers. Note, for instance, that in eliciting cue number 4 above, the numbers 7, 5/4, and 12/5 all are S^Δ's. Obviously, specification of the S^Δ's is arbitrary. Ordinarily, we would not include extremely obvious S^Δ's. For example, there would be little to be gained by showing a learner a picture of a snail or a typewriter or a chemist decanting a liquid and then asking him whether this is a proper fraction. The S^Δ's ought to be stimuli which have the potential of being confused with the S^D's and thus the capability of controlling a wrong response.

This is the specification of the limits in the IS:

S^D	S^Δ
fractions in which numerator is smaller than denominator.	1. fractions in which numerator is as large as or larger than the denominator; 2. Mixed numbers; and 3. Whole numbers.

The IS for our objective is now complete. Table 3 shows all the components of the IS. Though the contents of the IS appear to be quite straightforward, the construction of an IS is not a simple task. Whether it is written by a supervisor who is a specialist in a given area or by the classroom generalist, the good IS is not a one-trial product.

The IS now controls the teacher's instructing behavior. What he does and says, the kinds of materials he uses, the order in which he presents his material - all of these are dependent on the IS. Slowly, step by step, the teacher or the film or the programmed textbook or any combination of teacher and/or instruments will lead the learner through the combinations and permutations of the instructional and eliciting cues until the learner is displaying the behavior of interest under the stimulus conditions listed in the IS. If the teacher has chosen to use an instrument which can exercise a high degree of internal control over the learner, the teacher will do little more than stand by while the learner goes through the instructional sequence which has been prepared for him. If the control is to be exercised primarily by the teacher and if the instructional instrument is merely an aid to instruction, the instructional sequence will be considerably more flexible since the teacher can be responsive to the en route behavior of the learner. In either case, the instructional sequence will include all the cues and be subject to all the limits of the IS.

Given the IS of our example, we will find that the problem of selecting an instructional instrument is comparatively straightforward. If the teacher is to instruct a group of children, he might use a chalkboard or

Table 3

Instructional Specifications (IS) for a Unit in Fractions

Unit Objective

To identify and name a proper fraction.

Instructional Cue

The numerator of a proper fraction is always smaller than the denominator.

Eliciting Cues

1. Is the numerator smaller than the denominator? 2/3, 8/3, etc.
2. In which of these fractions is the numerator smaller than the denominator?

   5/3, 3/4, 1/1, 2/1, 7/4, etc.
3. Is this a proper fraction? 3/4, etc.
4. Which is a proper fraction? 7, 2/3, 5/4, 12/5, etc.
5. If you put a 3 in the blank, would you have a proper fraction?

   $\frac{(\_\_)}{5}$, etc.
6. What is this type of fraction called? 1/2, etc.

Limits

S^D	S^Δ
Fractions in which the numerator is smaller than the denominator.	1. Fractions in which the numerator is as large as or larger than the denominator.
	2. Mixed numbers
	3. Whole numbers

flannel-board or perhaps an overhead projector. The final selection will be dependent on what is available and what the teacher prefers to use. There is no definitive research to indicate that any one of these instruments would be significantly more effective than another. It is primarily a question of availability and convenience. There is little likelihood that a motion picture or a filmstrip or a video recording would be used. The production effort is incompatible with the relatively simple nature of the stimulus presentation involved in the instructional task. Even if a motion picture or filmstrip were available, it is unlikely that a teacher would prefer this kind of instrument to a chalkboard or flannelboard because the latter media are easier to use and permit a considerably higher degree of external control.

Some objectives seem to be intrinsically more amenable to implementation through the use of newer media than others. Let's consider a task which, at first glance, might demand a motion picture film. The IS, in Table 4, below, is intended for a fifth grade science teacher. The teacher's task is to bring his learners to the point where, given a phenomenon and a statement about it, they can decide correctly whether or not the statement is an observation or an inference.

The instructional instrument(s) for this objective differs significantly from those of the fraction example. The instructor will need a variety of pictorial stimuli since it is quite obvious that no teacher will be able to call up a moving car, smoke rising from a box, and a thermometer reading 105° _in realia_. It is also likely that a motion

Table 4

Instructional Specifications for an Objective in Fifth Grade Science Unit

---

Unit Objective: To classify statements of observation and statements of inference, given visual representations of specified objects and/or events to which the statements refer.

Sub-objectives: Given visual representations of specified objects and/or events:

1. To identify statements of observation
2. To identify statements of inference

Instructional Cues:

1. When you see an object or event, you are observing. (Observation)
2. When you do not directly see an object or event, but for a good reason guess that it exists, you are inferring. (Inference)

Eliciting Cues:

1. Do you see this?
2. Do you observe this?
3. Is this an observation?
4. Is there good reason to guess this?
5. Do you infer this?
6. Is this an inference?
7. Which statement is an observation? (Given two or more choices)
8. Which statement is an inference? (Given two or more choices)
9. Tell whether each statement is an observation or an inference.

Limits:

Statements of Observation

S^D	S^Δ
1. Visual stimulus: Black car moving	
The car is moving.	The car's motor is running.
The car is black.	The car has fuel.
Etc.	Etc.
2. Visual stimulus: Smoke rising from box	
The smoke is rising.	The box is hot.
Smoke is above the box.	There is fire in the box.

Table 4 - Con't.

3. Visual stimulus: Man laughing at red book	
The man is laughing. The book is red.	The man enjoys the book. The book is funny.
4. Visual Stimulus: Boy holding and eating red apple	
The boy hit the apple. The boy is holding the apple.	The apple is sweet. The boy is hungry.
5. Visual stimulus: Thermometer reading 105°	
The thermometer reads 105°. There are numbers on the thermometer.	It is summertime. It is a hot day.
6. Etc.	

Statements of Inference

S^D	S^Δ
All S^Δ's, from above, given the same visual stimuli.	All S^D's from above, given the same visual stimuli.

picture will be preferred since the S^{Δ}'s include a moving car and rising smoke. However, if a motion picture is not available and cannot be produced, it is possible that still pictures could be used effectively since both photographers and graphic artists know how to create the illusion of motion in a still picture. At any rate, the instructor will use either a motion picture, a slide, an overhead transparency, or a flat picture as the means of presenting the pictorial stimuli. He could, if he were an artist, draw the pictures on a chalkboard or on a paper chart.

The pictorial stimuli, however, are only half the story. The objective specifies that the learner must make a judgment concerning a verbal statement about the pictorial stimulus. The instructor must, then, select an instrument which will permit him to present the pictorial and the verbal stimuli simultaneously or at least in an extremely close temporal relationship. He must also decide whether he should present the verbal stimuli visually (i.e., as textual stimuli) or audibly.

IV. Media Characteristics

When a teacher knows precisely what eliciting stimuli he wants to present to a learner and what reinforcing stimuli he wants to present upon emission of the desired responses, the major portion of the instructional battle has been won. The job will not be complete, however, until the teacher has selected the best possible medium for presenting the stimulus of interest. What, then, are the stimulus-presentation characteristics of the various media?

Table 5 on the following page offers a very straightforward approach to this problem. The selected list of media in the vertical column is rated with respect to selected stimulus characteristics. If the medium is highly appropriate to the presentation of stimuli which possess a specified characteristic, this fact is designated by an X in the appropriate cell. If the medium is not highly appropriate or if the medium cannot handle a given characteristic at all, the cell is left open. Since many stimulus characteristics will appear in several places, the teacher will select that medium which offers the most plus and least minus characteristics with respect to the stimuli specified in the IS.

Though the characteristics of media appear rather formidable when presented in this tabular form, the fact is that it is considerably easier to acquire competency in identifying media characteristics than in specifying stimulus characteristics. If teachers are to develop the competency needed to select a medium best suited for the implementation of an objective, they will need to know the potential and the characteristics of the media. This knowledge, however, will never mediate teacher behavior in any significant manner until the teacher is able to define the responses of interest and to specify the stimulus conditions which are to control these responses. If this premise is correct, the considerable attention devoted in this chapter to the latter problem is commensurate with the importance of the problem. Furthermore, if this premise is correct, a substantial change of emphasis in our present pattern of teacher education is indicated. It will do us little good to train teachers who are highly

Table 5

Media Characteristics

MEDIA	Projected				Non-Projected			Recorded Sound			3-D Materials			
CHARACTERISTICS	Slides	Filmstrips	Overhead transparencies	Opaque materials	Charts, posters, bulletin boards	Chalkboards	Programmed textbooks	Tape	Records	Sound Track	Motion Pictures	Realia	Models and mock-ups	Community trips
Black and White	X	X	X	X	X						X	X		
Color	X	X		X	X						X	X		
High reality	X	X		X				X	X		X	X	X	X
Simultaneous picture and text	X	X		X			X				X			
Flexible sequence	X		X	X										
Internally controlled pacing	X							X	X	X	X			
High enlargement	X	X									X		X	
High reduction	X	X									X		X	
3-dimensional												X	X	X
Movement											X		X	X
Simultaneous eliciting stimulus and feedback					X		X	X	X	X	X			
Sound accompanying	X										X			
Fixed sequence		X					X	X	X	X	X			
Externally controlled pacing	X	X						X		X				
2-dimensional	X	X	X	X	X	X					X	X		

MEDIA	Projected				Non-Projected			Recorded Sound			3-D Materials			
CHARACTERISTICS	Slides	Filmstrips	Overhead transparencies	Opaque materials	Charts, posters, bulletin boards	Chalkboards	Programmed textbooks	Tape	Records	Sound track	Motion pictures	Realia	Models and mock-ups	Community trips
Cueing of non-verbal responses											X		X	
Flexibility and variation of representation			X	X		X								
Differential illumination of components or pathways			X											
Monochromatic			X			X								
Provision for overt responses							X				X			
Static	X	X		X	X		X		X	X	X	X	X	X
Dynamic			X			X		X						
Successive approximations of terminal behavior							X							
Individual pacing							X	X						
Immediate feedback							X	X			X			
Adaptive to learner's responses							X							
Lip synchronization										X	X			
En route responses							X	X	X		X			

skilled in the use of media unless these teachers are equally skilled in specifying the dimensions and characteristics of instructional tasks.

FOOTNOTES

1. Robert F. Mager, Preparing Objectives for Programmed Instruction (San Francisco, California: Fearon, 1962); Defining Educational Objectives, ed. C. M. Lindvall (Pittsburgh, Pennsylvania: University of Pittsburgh Press, 1964)

2. Mager, p. 53.

3. Richard E. Schutz, Robert L. Baker, and Vernon S. Gerlach, Measurement Procedures in Programmed Instruction (Tempe, Arizona: Classroom Learning Laboratory, Arizona State University, 1964).

CHAPTER V

EDITOR'S COMMENT ON CURL'S AND KEMP'S PAPERS

The Curl and Kemp papers are presented as complementary examples of the development of skills in the area of production and operation of equipment. Although the papers are not presented by the authors as examples of response-oriented self-instructional systems, the editor proposes to put them into such a context. These two papers viewed together are really illustrative of what Gerlach does except that they are case studies from the field of media. Therefore, instead of using mathematics as Gerlach does, Curl presents a self-instructional laboratory for the operation of the necessary equipment, and Kemp presents the necessary elements which could lead to desired production skills and understandings.

Just as theory is not to be studied for theory's sake, so the editor would like to suggest that skills should not be learned simply for the sake of acquiring them. Self-instructional laboratories must be provided so that the teacher education student can develop materials or operate equipment when such demands are made upon him by the academic or professional sequence. A student should not be required to develop overhead transparencies just for the sake of knowing how; the skill should be developed at a time when the neophyte teacher is required to make a presentation using the overhead as a part of an assignment in an academic or professional course. The time to learn how to operate a motion picture projector is the time when a student is using the projector as a part of a class activity or when he wishes to use a motion picture as an informational device in the same way in which printed materials might be used.

As will be discussed at greater length in the final chapter, the above suggested approach may seem to minimize the need for media competencies and the necessity for careful planning. The fact is that it will require more structuring and more planning to be sure that the teacher education program imposes a wide range of requirements for the utilization of media for the student's own learning as well as for presentations in classes, which hopefully will be response-oriented.

The Curl and Kemp papers, therefore, are ideal vehicles for implementing the ideas contained in the preceding papers.

EDITOR'S COMMENT ON CURL'S PAPER

The Curl paper is an excellent example of how a self-instructional, response-oriented laboratory can be developed. Such a laboratory should be available on a twenty-four hour basis so that students could have access to the various self-instructional units whenever they needed to develop a particular skill in equipment operation.

A mistake which can easily be made is to assume that students in teacher education should be herded through a laboratory in isolation from the application of the skill. There is a good deal of evidence that unless the reasons for learning how to operate equipment are evident and continual practice required, the skills a self-instructional laboratory can teach will be lost in a very short time. This report argues that as far as possible everything which is done in the teacher education program should be functional and should enhance the students' learning.

SELF-INSTRUCTIONAL LABORATORIES FOR TEACHING OPERATIONAL SKILLS

David H. Curl*

I. Historical Background

Some persons, according to Edgar Dale, discuss instructional technology as though there were a real choice whether we should introduce it in the schools. According to Dale there is no such choice. Our only choice is whether we use educational technology wisely and plan for it or whether we use it grudgingly, ineptly, purposelessly.[1] The 1962 National Education Association audiovisual task force position paper described some of the functions of media and the changing role of the teacher in an instructional system.[2] Systems approach has become a respectable and popular term in describing the organizational design and roles of people and devices, of teachers and media.

The teacher is not likely to be put out of a job by automation or by mass media, but her traditional role of information dispenser is certainly going to change. In the interest of efficiency the teacher must become the manager of an entire instructional system: a planner, coordinator, and consultant; in short, a professional educational specialist. Pressey argued as early as 1926 that the teacher can and should be freed from as many as possible of the mechanical tasks of the profession so that "she can be a real professional teacher, not a clerical worker."[3] Skinner, during the birth pangs of the teaching machine, predicted that the new technology would permit teachers to do "real teaching," to be effective as human beings without "ditch digging."[4] Certainly the advantages of applying the systems approach and programed instruction in the classroom should apply equally to the teacher education curriculum.

---

*Assistant Professor of Education, The University of Chicago, Chicago, Illinois

Schutz and Baker, in discussing the implications of programed instruction for the teacher education curriculum, emphasized the need for stating behavioral goals. They pointed out how difficult this has been in the past because teaching was considered an art rather than an applied technology. The same authors go on to describe education courses actually as being survey courses which emphasize a "content about" rather than an "application of" approach. They feel that serious changes in teacher education will occur only when such means as self-instructional technology are provided for satisfying individual differences among teacher trainees.[5]

A system implies optimum use of all its components. Therein learners seek and obtain information from things, acquire values and direction from people, and develop confident maturity borne of intensive, successful, personal participation. Certainly, if teacher trainees are to be expected to devise and manage instructional systems within their own classrooms, teacher training programs must create situations in which prospective teachers participate actively with media and have opportunities to observe media being used. Media alone can serve as resources when basic information or manipulative skills are to be mastered by learners as tools preliminary to creative activity or research. Self-instructional materials can allow instructors to attend to individual needs of students, while media serve simultaneously as patient, private tutors, allowing each learner to proceed at his own pace. A teacher-educator's time spent in preparing self-instructional materials often will pay off not only in time eventually saved but also in more thorough learning.

Perhaps the most likely starting point in automating the teacher education curriculum would be the teaching of fundamental perceptual-motor skills, such as the operation of audiovisual equipment. Such skills ultimately may become superfluous to the classroom teacher. Widespread use of electronic information retrieval and distribution systems and employment of para-professional teacher aides may relieve the teacher from much of the responsibility for operating mechanical devices. Meanwhile, however, teachers going into service must be acquainted with the tools which they can expect to find in schools of today as well as with new utilization strategies for tomorrow.

Scores of research projects have compared the effectiveness of various media for the teaching of mechanical skills, but most of these studies have been for the purpose of solving immediate training problems within the armed forces or industry. The investigations to be considered here are the ones most relevant to self-instructional programing, studies of the use of audiovisual media as demonstration devices in situations in which the learner was expected to respond by performing the task demonstrated.

As the result of an experiment in teaching naval personnel, Lefkowith concluded that there is an important interaction between teaching methods and testing methods. He suggests, logically, that if the testing situation is to be the operation of real equipment, then it follows that the teaching method should involve the study and manipulation of the actual equipment or an accurate representation.[6]

Some early attempts to teach perceptual-motor skills by the use of motion picture films and slide films were inspired by some of the "obvious" advantages described by Vandermeer. Vandermeer published, in 1945, the results of a classic study in which he had varied utilization practices in teaching lathe operation to groups of adults by the use of demonstration films. He found that the use of films definitely reduced training time and produced more factual information about machine operation. He suggested that further studies explore the generalization of these findings in training operators of other types of machines, that media other than films be tried, and that media be adapted to individualized training.[7]

Roshal studied the effects of learner representation on learning to tie knots. He found that the film was more effective if the task was portrayed from the viewing angle that would be assumed by the learner in performing the task (subjective camera) and that a presentation of the motions involved was more effective than showing a series of static photographs when a particular motion was important to the procedure.[8]

Two studies were made by Jaspen on the effects of a number of film variables on learning to assemble the breech block of a 40mm antiaircraft gun. An experimental film was able to teach 98 percent of the subjects how to assemble the breech block. Jaspen concluded that a slow rate of development, the pointing out of errors to be avoided, repetition of the assembly demonstration, and active participation by the learners in performance of the task contributed significantly to the effectiveness of the film.[9]

Vandermeer and Cogswell successfully used a film to teach Army trainees how to operate a 16mm motion picture projector. They concluded that certain complex skills can be taught by films alone and that favorable attitudes toward the task may be instilled at the same time.[10]

In an Air Force study, Kimble and Wulff found that increasing the amount of individual coaching and guidance furnished the students resulted in superior learning from a training film on use of the slide rule.[11] Hoehn and Lumsdaine described the development and testing of an endless-loop, cartridge-loaded 16mm motion picture projector which was designed to start and stop automatically and to skip certain parts of the program if desired.[12] This machine, of course, was one of the forerunners of the popular 8mm cartridge projectors which are now commercially available.

Maccoby and Sheffield sought to discover an optimum relationship between the length and number of demonstration-attention periods and the length and number of practice opportunities in learning from demonstration films. The authors concluded that with lengthy sequential tasks, practice is probably particularly useful if it follows demonstration segments which constitute natural units of the task and that the optimum use of practice probably involves transition from smaller to larger segments of the task, the aim being to maximize both the accuracy of initial practice and the serial integration of the task as a whole.[13] Lichtblau used 2" x 2" slides to teach industrial arts skills to junior high school pupils. His findings tend to support those of the earlier motion picture studies. His most interesting conclusion is that explanations of why a certain procedure should be followed should not be included unless the explanations are absolutely essential to the learning of some important part of the skill being taught.[14]

Klass, Reshovsky, and others have described methods of reducing the number of errors and increasing production output by assembly line workers. Each worker is required to perform his portion of a complex assembly line task while watching a small rear-projection screen on which are projected 2" x 2" slides showing each step of the operation in proper sequence and at a supposedly optimum rate. A synchronized tape recording may provide background music and interject verbal instructions when required.[15]

Curl combined carefully programed 2" x 2" slide sequences with tape-recorded narration to teach equipment operation skills to foreign students having English language handicaps. He found that perceptual-motor skills relating to the operation of certain types of photographic equipment can be taught individually by means of flexible self-instructional type programs and that necessary verbal cues can probably be presented as effectively in the form of captions, when properly integrated with the visuals, as with a separately recorded commentary.[16]

Meierhenry, in summarizing needed research in the introduction and use of audiovisual materials, suggested the need for identifying and designing specific media which will fulfill certain instructional objectives and purposes. He suggested that answers are needed to such vital questions as how we may weave together two or more types of media to get the best learning, what are the principles affecting design of multiple-media systems, and what are the principles governing the relationships of media to people, to other media, and to specific learning objectives.[17]

Reeves and Torkelson were among the first to report on a self-study approach to teaching an audiovisual unit for pre-service teachers. They taught equipment operation and basic theoretical and factual material at Pennsylvania State University through the use of a wide variety of media. Students were required to operate equipment themselves in order to use the media, the media then providing information needed by students in fulfilling requirements of the course. The authors concluded that perceptual-motor skills definitely can be taught to pre-service teachers through specially prepared self-instructional materials, although there remained some doubt about learners' acquisition of theoretical concepts and methodology by the particular approach used.[18]

Mars described the pioneer Syracuse University self-instructional program as being one in which students follow a predetermined sequence, as shown in Figure 6. They begin with the tape recorder, learn its operation by using a flip chart and instruction sheet, and then progress to more complex devices using the piece of equipment previously studied to provide

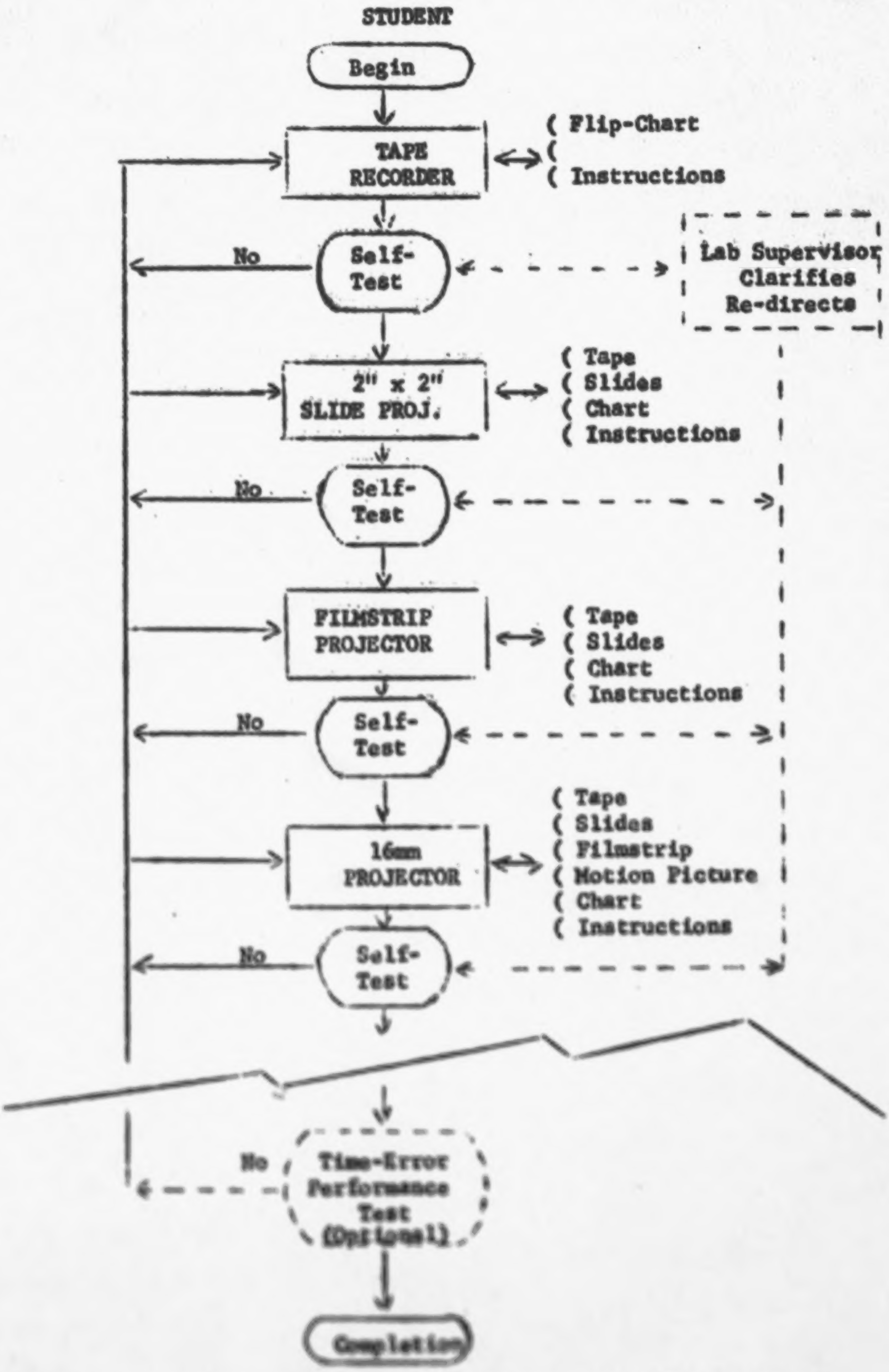
STUDENT
Begin
TAPE RECORDER
(Flip-Chart
(
(Instructions
No
Self-Test
Lab Supervisor
Clarifies
Re-directs
2" x 2" SLIDE PROJ.
(Tape
(Slides
(Chart
(Instructions
No
Self-Test
FILMSTRIP PROJECTOR
(Tape
(Slides
(Chart
(Instructions
No
Self-Test
16mm PROJECTOR
(Tape
(Slides
(Filmstrip
(Motion Picture
(Chart
(Instructions
No
Self-Test
No
Time-Error
Performance
Test
(Optional)
Completion

Figure 6. The Syracuse Plan for Self-Instruction (Abbreviated)

their own step by step coaching. Operation of any given item, therefore, calls for mastery of all previous equipment in the sequence, an arrangement which provides valuable extra reinforcement.[19]

A variation of the cumulative sequence approach was described by Haleff of Hunter College. Students start with the simplest device (opaque projector) and progress finally to the most complex (16mm motion picture projector) through the use of written instructions supplemented by slide-tape sets and loop films which illustrate specific points not easily described in the printed sheets. Loop films with blank leader segments allow timed practice and may run continuously throughout a group training session so that all students may observe them at will.[20]

An entirely different approach was developed by Curl and Erickson at the University of Connecticut. Twelve separate booths were constructed, each containing only one item of equipment or one process to be learned. An 8mm cartridge film demonstrates crucial portions of each task, and a carefully programed 2" x 2" slide sequence breaks down each task into demonstration-practice segments of optimum size. (See Figure 7.) Students are free to start in any booth and to work with the equipment in any sequence, matching their actions with the slides, then testing themselves on each step as they go along. Carousel projectors with individual controls allow students to skip, reverse, and repeat slides or sequences as desired. Though the slide set provides the basic, detailed instruction, the demonstration film is always available for review by flipping a switch. A unique feature of the Connecticut plan is the emphasis on developing the trainee's

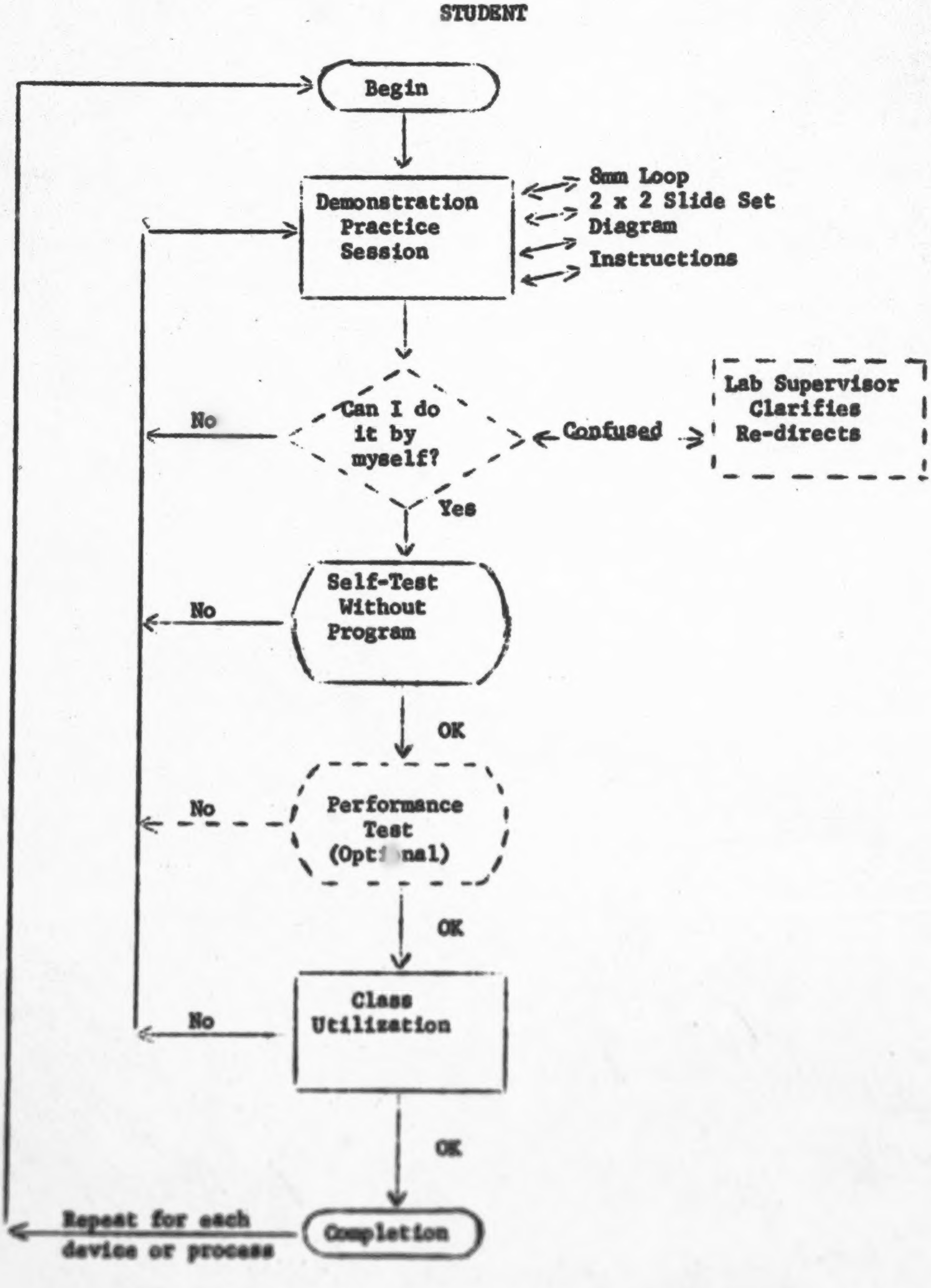
STUDENT
Begin
Demonstration
Practice
Session
8mm Loop
2 x 2 Slide Set
Diagram
Instructions
Can I do
it by
myself?
No
Confused
Lab Supervisor
Clarifies
Re-directs
Yes
Self-Test
Without
Program
No
OK
Performance
Test
(Optional)
No
OK
Class
Utilization
No
OK
Completion
Repeat for each
device or process

Figure 7. The Connecticut Plan for Self-Instruction

self-confidence with equipment and processes rather than on perfection of the skills themselves. After testing several trainees, the designers of the program dropped the performance test. Most students were found to be motivated sufficiently by a desire to make a good showing in methods classes and student teaching that they learned the skills sufficiently for transfer just by completing the program provided they were allowed to determine their own practice schedules and to set their own pace without close supervision.[21]

Some attempts have been made to use loop films alone or with worksheets in skill training. Some major advantages, limitations, and special techniques dealing especially with 8mm cartridge films for teaching production skills and equipment operation were well summarized recently by Gerlach and Vergis of Arizona State University.[22] Such films are being used routinely by them and by Kemp of San Jose State College. Film cartridges needed for certain assigned projects are taken by students to their individual work-stations. The films provide the equivalent of an immediate, live demonstration.

Modified linear-type programed texts were the media chosen by Johnson of the University of Colorado and by Freedman of the New York City Board of Education. Simply very good instruction manuals, such texts lead students one step at a time through each process rather than confronting them at once with a hugh mass of information. Clearly illustrated and carefully engineered to elicit and reinforce student response, such programs have the advantages of easy distribution, portability, and low quantity production cost.[23]

II. Theoretical Background

Typically, laboratory instruction on the operation of audiovisual devices has been by the demonstration-practice method or, when enough experienced assistants were available, the coach-pupil method.

The demonstration-practice or, more often, "demonstration-scramble" method features a live classroom demonstration of each device or process to the entire group of trainees by the senior instructor. Students are expected to observe (if they're sitting close enough to see), to take notes (on everything), and then to report at some later date to a practice laboratory session in which they may actually get their hands on the equipment. At best, students may "scramble" immediately following the demonstration to get in their practice while some of the main points of the instructor's presentation are still fresh in their minds. Unfortunately, there seldom are enough pieces of equipment for everyone to practice (or even to look on), and the instructor and his semi-trained assistants cannot be everywhere at once. So, the student who is afraid of machines and who possesses little mechanical know-how is not likely to get a fair change to overcome her handicaps, unless she has the good luch to be very pretty.

The coach-pupil method is effective only to the degree that the instructors themselves are qualified, patient, and available. Also, half the time of both coach and pupil is spent watching the other perform. (See Figre 8.)

Demonstrations have been proved most effective when trainees pracice simultaneously with the demonstration or immediately thereafter.[24] But in

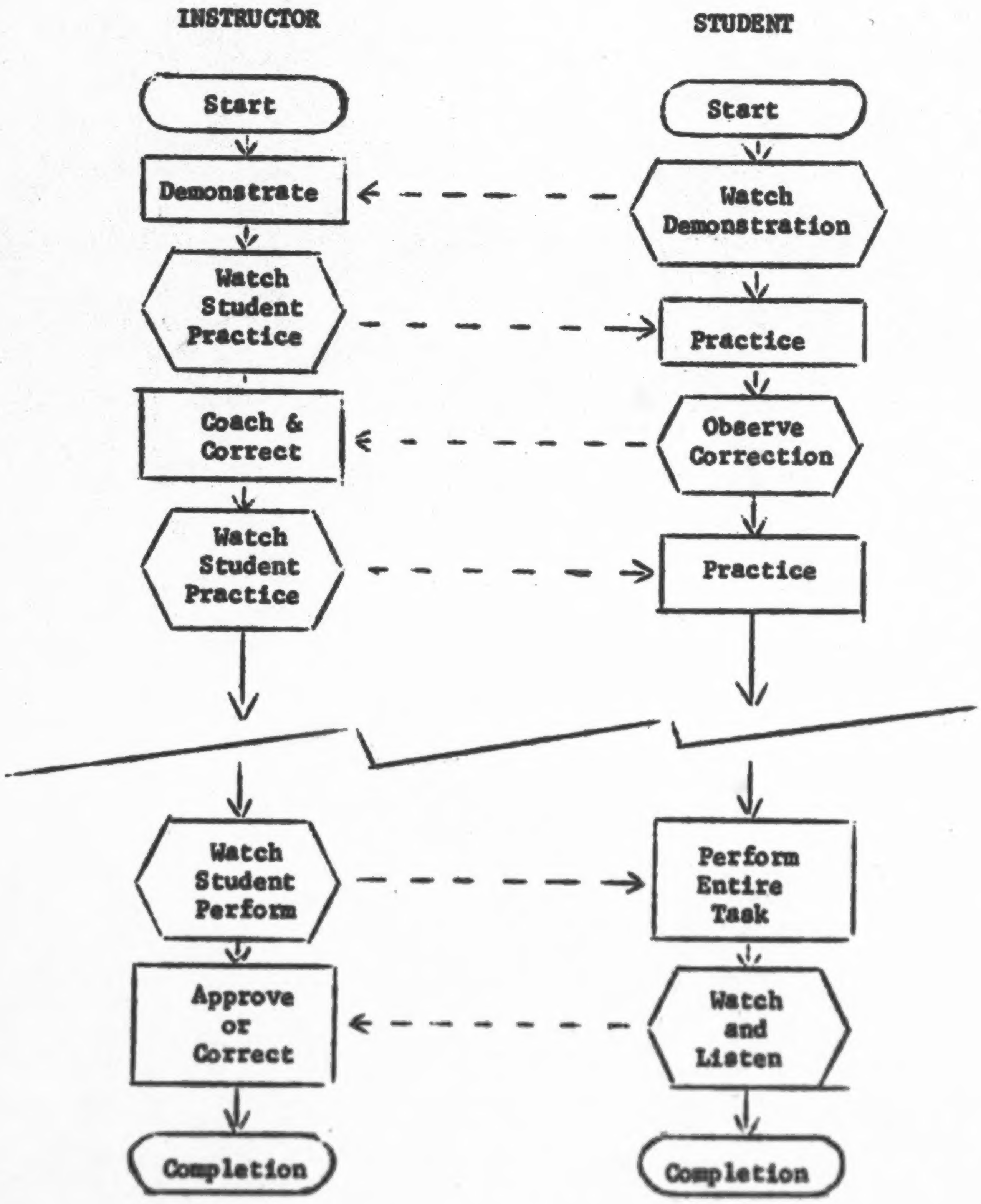
INSTRUCTOR
STUDENT
Start
Start
Demonstrate
Watch Demonstration
Watch Student Practice
Practice
Coach & Correct
Observe Correction
Watch Student Practice
Practice
Watch Student Perform
Perform Entire Task
Approve or Correct
Watch and Listen
Completion
Completion

Figure 8. The Coach-Pupil Method of Instruction

order to accommodate many trainees, this arrangement usually requires a prohibitively large inventory of equipment and many experienced personnel. The "each one teach one" method also raises doubts about consistency of instruction.

Automated self-instruction offers several advantages: instruction is consistent while allowing for individual differences in aptitude; equipment inventories can be limited to one item of each type, excepting display projectors; equipment may be left set-up; scheduling conflicts are all but eliminated; no student need feel "forced" into a humiliating mechanical confrontation before others; fewer instructors are needed and they can use their time and class lecture time for discussing problems of evaluation, utilization, and curricular integration of media.

III. Required Teacher Competencies

Which competencies, specifically, should be required of teachers, both pre-service and in-service? Should all teachers acquire the same competencies, or, if some individuals expect to become "media managers" or "TV teachers," how should their teacher education experiences differ from those of the teachers who will remain in the self-contained classroom? The role of the teacher is changing. Audiovisual equipment being taught today in college courses may be gathering the dust of obsolescence before today's students become tomorrow's teachers. (How many of us still include the 3 1/4" x 4" lantern slide projector in our equipment laboratory sequence?).

The following table 6 attempts to determine how the pattern of needed teacher competencies might shift as teacher roles evolve through five stages

Table 6

Category	I	II	III	IV	V
Use of AV Materials	None except possibly teacher-made	Limited	Considerable	Extensive	Exclusive
Competencies Needed (Ability to set up and operate these devices):	"Pet" device or process, if any. (1)				
16mm Projector		1,2	1,2	1,2,3	
8mm Projector				3	
8mm Cartridge Projector			1	3	
35mm Filmstrip Projector		1,2	1,2	1,2,3	
2" x 2" Slide Projector			1,2	1,2,3	
Overhead Projector			1	1	
Opaque Projector		1,2	1,2	1,2,3	
Record Player		1	1	1,3	
Tape Recorder			1		
TV Receiver			1	1,3	
Master Control Console				1,4	1,4
Electronic Feedback System					1,4

Table 6 Cont'd

Category	I	II	III	IV	V
Photocopier			1	1,2,3,4	
Still Camera			1	1,2,3,4	
Movie Camera				1,2,3,4	
(Ability to perform these processes):					
Graphics Production			1,2	1,2,3,4	
Task Analysis				1,4	1,4
Production Planning			1	1,2,3,4	1,4
Scripting				1,2,3,4	1,4
Systems Design				1,4	1,4
Program Writing				1,4	1,4
Production Supervision				1,4	1,4
Program Editing				1,4	1,4
Program & System Evaluation				1,4	1,4
Computer Programming					1,4

Key:
1 - Teacher use in classroom or resources center
2 - Supervise student technician
3 - Teach students to operate device and supervise their use
4 - Cooperate with professional technicians

from classroom autocrat to manager of a sophisticated learning environment. Category I, the completely self-contained classroom, wherein the teacher along (with textbooks) is the sole source of content and sole purveyor of information, probably requires no audiovisual competency at all except perhaps the art of writing legibly on the chalkboard. Categories II and III require increased skill on the part of the teacher as she supplements and enriches her own presentations with many media. Category IV requires more supervisory ability as the teacher begins to employ media as self-contained resources and to motivate, direct, and supervise students, as described by Erickson,[25] in their pursuit of solutions to meaningful problems. As Category V is reached, the teacher has become a diagnostician, a system designer, and a manager. To her students she will become a counselor and consultant; she will provide human values while devices dispense data; she will help her students to adapt to a world of automation without allowing them to become automatons. While becoming obsolescent as a teacher, she will become more indispensable as a human being. Our teacher education programs must not continue to train teachers for the 1950's but must equipt them to help students cope with life in the 1980's and beyond.

IV. Development of Competencies

Self-instructional systems can provide most of the fundamental skills needed by teacher trainees for operation of present and future technological devices and instructional hardware. Probably many other skills and techniques in the areas of analysis, design, production, and evaluation of systems and system components can be developed, at least in part, through systems which include elements of simulation and self-evaluation in addition to clarification and individual coaching by their professors. Logically, these experiences would be made available to teacher trainees at times of greatest interest and need, prior to student teaching or congruent with methods course presentations by students or their participation in simulated classroom environment experiences. Mastery of such skills would increase students' self-confidence and give them a chance to practice putting on really superior presentations and to receive constructive feedback. In-service teachers trained in this way would be uniquely able to transfer their new experiences directly to their daily activities, modifying and adapting to fit their own needs.

The optimum sequence format for self-instructional laboratories has not yet been determined. Perhaps the ideal will emerge as a blending of the programed text and a combination of the Syracuse and the Connecticut plans for organizing and presenting sequences of material.

One thing is certain. Students can teach themselves fundamental skills to a very satisfactory level of performance. Perhaps they can teach themselves far more than anyone now realizes, at the same time harvesting dividends of discovery and self-confidence. Economies of time and resources realized through automated self-instruction, if wisely used, will result not in generations of conditioned button pushers but in a nation of more liberally educated citizens. Many teacher education institutions are now squarely facing the vital task of analyzing, updating, and restructuring many parts of their curricula. To stimulate such thinking and action is the purpose of this paper and of this seminar.

FOOTNOTES

1. Edgar Dale, "The Teacher and Technology," The News Letter (Bureau of Educational Research and Service, The Ohio State University), XXIX (1963), 1.

2. Barry Morris (ed.), "The Function of Media in the Public Schools," Audiovisual Instruction, VIII (1963), 9-14.

3. Sidney L. Pressey, "A Simple Device Which Gives Tests and Scores--and Teaches," School and Society, XXIII (1926), 373-376.

4. Benjamin F. Skinner, "Teaching Machines," Science, CXXVIII (1958), 969-977.

5. Richard E. Schutz and Robert L. Baker, "Programed Learning and the Teacher Education Curriculum," Audio-Visual Communication Review, XI (1963), 253-259.

6. Edwin F. Lefkowith, The Validity of Pictorial Tests and Their Interaction with Audio-Visual Teaching Methods, Technical Report SDC 269-7-49 (The Pennsylvania State University Special Devices Center, Port Washington, Long Island, New York, August, 1955).

7. A. W. Vandermeer, "The Economy of Time in Industrial Training: An Experimental Study of the Use of Sound Films in the Training of Engine Lathe Operators," Journal of Educational Psychology, XXXVI (1945), 65-90.

8. Sol M. Roshal, Effects of Learner Representation in Film-Mediated Perceptual-Motor Learning, Technical Report 269-7-5 (The Pennsylvania State College Special Devices Center, Port Washington, Long Island, New York, 1949).

9. Nathan Jaspen, Effects on Training of Experimental Film Variables, Study I: Verbalization, Rate of Development, Nomenclature, Errors, "How-It-Works," Repetition, Technical Report SDC 269-7-17, Instructional Film Research Program, Pennsylvania State College Special Devices Center, Port Washington, L. I., N. Y., October 1950, 13 pp; and, Jaspen, Nathan, Effects on Training of Experimental Film Variables, Study II: Verbalization, "How-It-Works," Nomenclature, Audience Participation, and Succinct Treatment, Technical Report SDC 269-7-11 Instructional Film Research Program, Pennsylvania State College Special Devices Center, Port Washington, L. I., N. Y. March 1950, 13 pp.

10. A. W. Vandermeer and John Cogswell, *Instructional Effect of the Film "How To Operate the Army 16mm Sound Projector Set,"* Technical Report SDC 269-7-29 (The Pennsylvania State University Special Devices Center, Port Washington, Long Island, New York, September, 1952).

11. G. A. Kimble and J. J. Wulff, *The Effect of "Response Guidance" on the Value of Audience Participation in Training Film Instruction*, HFORL Report No. 34 (United States Air Force Human Factors Operations Research Laboratories, Washington, D. C., 1953).

12. A. J. Hoehn and Arthur A. Lumsdaine, *Design and Use of Job Aids for Communicating Technical Information*, Technical Report AFPTRC-TR 58-7, ASTIA Doc. No. AD 152 109 (Air Force Personnel and Training Research Center, Washington, D. C., January, 1958).

13. Nathan Maccoby and Fred D. Sheffield, "Theory and Experimental Research on the Teaching of Complex Sequential Procedures by Alternate Demonstration and Practice," in *Symposium on Air Force Human Engineering, Personnel, and Training Research*, Pub. 516 (National Academy of Sciences and National Research Council, Washington, D. C., 1958).

14. Leonard R. Lichtblau, "Slides for Perceptual-Motor Skills--An Examination of Some of the Factors Which Make Slides Effective in Teaching a Perceptual-Motor Skill in a Junior High School Industrial Arts Shop," unpublished dissertation (New York University, 1958).

15. Philip Klass, "Video-Sonics Cuts Production Defects," *Aviation Week*, LXXII (1960), 12; Ernest E. Reshovsky, "IAVA's Production Workshop," *Photo Methods for Industry*, III (1960), 61.

16. David H. Curl, "An Exploratory Study of a Self-Instuctional Method for Teaching Equipment Operation," unpublished dissertation (Indiana University, 1961).

17. Wesley C. Meierhenry (ed.), "Needed Research in the Introduction and Use of Audiovisual Materials: A Special Report," *Audio-Visual Communications Review*, X (1962), 307-316.

18. T. M. Reeves and G. M. Torkelson, "Self-Instruction in Audiovisual Education: A Title VII Progress Report," *Audio-Visual Communication Review*, VIII (1960), 202-206; G. M. Torkelson, "Self-Instructional Audiovisual Education," in *New Media in Higher Education*, ed. James W. Brown and James W. Thornton (Washington, D. C.: Division of Audiovisual Instructional Service, National Education Association, 1963), pp. 121-123.

19. Walter J. Mars, "Self-Instruction in the Operation of Common Audiovisual Instructional Devices," in *New Media in Higher Education*, ed. James W. Brown and James W. Thornton (Washington, D. C.: Division of

Audiovisual Instructional Service, National Education Association, 1963), pp. 120-121.

20. Maxine Haleff, "Self-Instruction in the Operation of Audiovisual Equipment," in *Proceedings of the New York State Convocation on Educational Communications* (Albany, New York: State Education Department, 1964), pp. 206-207.

21. David H. Curl, "Automated Equipment Operation Training," *Audiovisual Instruction*, X (1965), 564-565.

22. Vernon S. Gerlach and John M. Vergis, "Self-Instructional Motion Pictures," *Audio-Visual Communication Review*, XIII (1965), 196-204.

23. Donald W. Johnson, *Filmstrip-Slide Projector*, and five other titles, Self-Instructional Manuals (Bureau of Audiovisual Instruction, The University of Colorado, Boulder, Colorado, 1963); Morris Freedman, "Teacher Training through Programed Instruction," in *Proceedings of the New York State Convocation on Educational Communications* (Albany, New York: State Education Department, 1964), pp. 157-160.

24. See Klass, Maccoby and Sheffield, and Vandermeer and Cogswell.

25. Carlton W. H. Erickson, *Fundamentals of Teaching with Audiovisual Technology* (New York: The Macmillan Co., 1965).

EDITOR'S COMMENT ON KEMP'S PAPER

Kemp's paper emphasizes several very important factors in relationship to the new design of teacher education. First of all, it makes reference to the problem of design of materials. The design or encoding function is a crucial one in the development of learning materials in general but has particular relevancy to the media field. The design function pertains to the development of scope and sequence of content as well as to the selection and development of appropriate learning resources. Thus, a part of the design problem is to make a selection from among various media; another part is to develop or produce the medium in such a way that it does in fact bring about the appropriate behavior on the part of the learner.

Although Kemp does not deal with design specifically, the process is inherent in systems development in theory and in the response-oriented model of Gerlach. Therefore, the approach is related to the earlier papers, and Kemp has described the ways in which specific competencies can be developed for the preparation of each medium chosen as appropriate.

Another important contribution of the Kemp paper is the recognition that most commercially prepared media are usually stimulus-oriented. He recognizes that one of the major reasons for local production is the necessity to create response-oriented materials. Therefore, it is evident that Kemp's contribution is in harmony with the general philosophy which the preceding chapters have developed.

In reading Kemp's paper, one might disagree on the specific competencies which are considered "basic," as opposed to "optional." Some persons, for example, might also wish to add programed instruction, which is omitted entirely.

IDENTIFICATION OF PRE-SERVICE AND IN-SERVICE TEACHER COMPETENCIES IN THE AREA OF AUDIOVISUAL PRODUCTION TECHNIQUES

Jerrold E. Kemp*

I. Introduction

Audiovisual materials required in the instructional programs of schools can be divided into two broad categories and subdivisions as follows:

1. materials produced by commercial concerns and other organizations and purchased by schools and school systems; and
2. materials produced by personnel of a school or school system for its own program
   a. by professional and/or technical staff for school-system-wide use,
   b. by professional and/or technical staff for individual school use (instruction, in-service, public relations), or
   c. by teachers and possibly students for their own direct classroom use.

This paper will be concerned primarily with category 2c, pre-service experiences and teachers' roles related to competencies in the production of audiovisual materials. Also, in light of emerging developments, consideration must be given to changes in these roles and different responsibilities as more professional and technical assistance (category 2b above) becomes available in schools to backstop teacher efforts and serve needs for locally produced instructional materials.

---

*Professor of Education and Coordinator, Materials Production, Audio-Visual Service Center, San Jose State College, San Jose, California

II. Historical Background

The military and civilian training programs during World War II have been instrumental, since the early postwar years, in fostering the growth of audiovisual programs in public education. But long before this widespread educational interest in various phases of media was shown, some school systems were providing audiovisual materials of a local nature to meet specific needs.

Rathman's report on the organization and activities of the museum sponsored by the St. Louis schools, as observed in the early 1920's, was among the earliest recognition given to school-sponsored production work. He found that a darkroom and equipment needed for producing moving and still pictures were included in the museum's facilities. In addition, models and mounted specimens were prepared for distribution to the 3,000 schoolrooms in St. Louis.[1]

Information on the early organization of the visual education department of the Los Angeles public school system was given by Roach in his report to the 1929 National Education Association convention. He told how the division was divided into several sections, one of which was the photographic section. This section prepared photographs and slides. The section's staff included a specially trained teacher assistant, three photographers, and two clerks. In addition, production activities were carried on by the art section, whose artists designed special posters and charts, tinted pictures, and slides.[2]

The first recognized nationwide survey of visual aids in school systems was made in 1936 by the U. S. Office of Education with the cooperation of the American Council on Education. One result of this survey showed that 575 motion picture cameras were owned by the 8,806 schools reporting, or about 1 camera for every 14 schools and school systems. Information concerning the use of such equipment revealed that the first film believed to be produced by a high school was made in 1923. At that time the Montclair (New Jersey) High School produced a humorous sketch entitled "She Stoops to Crank'er."[3]

Dale and others, as part of their bibliography on motion pictures in education, reviewed 37 articles dealing with film production in schools. Two of these articles appeared before 1930, an additional 5 articles were published before 1933, and 30 were reported between 1933 and 1938.[4] This gave some indication that motion picture production activity was going on in schools prior to 1930 and for a number of years thereafter there was some growth.

With this interest being shown in school-produced motion pictures, a number of publications appeared especially designed to help schools with the many problems of producing acceptable motion pictures. Among the more valuable of these were the following: *Students Make Motion Pictures: A Report on Film Production in the Denver Schools* by Brooker and Herrington; *Producing School Movies: A Manual for Teachers and Students Interested in Producing Amateur Films by* Childs and Finch; and *Making School Movies* by

Hart and Wenger.[5] In addition, a special department was included in the audiovisual periodical Educational Screen entitled "School-Made Motion Pictures" to serve as a clearing house for the exchange of ideas and experiences and to answer questions relating to motion picture production in schools. Finch and later Schneider served as editors for this department.[6]

The experiences gained during World War II with regard to the local production of audiovisual materials were described by Miles and Spain:

> "In the early days of the war instructors had few resources for and little assistance in illustrating and implementing the generally brief statements of objectives, methods, and content of official courses of study. Yet it was the accepted doctrine to prepare, explain, and demonstrate, and there were few textbooks to use. Local schools therefore early began to utilize their various resources for the development of teaching materials. Many schools had acquired staffs which included educators, writers, artists, draftsmen, machinists, carpenters, and others with professional or vocational competencies. These staffs found means to coordinate the development of specific courses of instruction with instructor-training, supervision, and the production of needed teaching materials."[7]

Miles and Spain further believed that these wartime experiences had implications for normal civilian education: "Many highly effective audiovisual aids cannot be produced in the classroom without financial resources other than those now available to vast numbers of schools. Yet military and civilian educational experiences have shown that the creative teacher with proper leadership can devise, substitute, create, and make available certain types of learning aids which are often as effective as expensive and elaborately designed devices."[8]

Brief mention should be made of developments in educational radio and television as both have bearing on local production activities. Swick pointed out the plight of educational radio stations in the early days: "In the early 1920's public schools had their own AM radio stations. Cost of engineering, equipment, and attractive programming proved more than these non-profit stations could pay. In the ensuing competition with commercial stations for audience and scarce frequencies, all but one of these pioneer AM stations (Cleveland public schools) went off the air."[9] The picture for educational radio looked much brighter after World War II when the Federal Communications Commission reserved 20 FM channels exclusively for educational institutions, allowing for nearly 800 stations. According to Shirts, the first noncommercial, low wattage FM station to be operated by a public school system was established in New Albany, Indiana.[10] By September, 1951, there were 34 such noncommercial educational FM broadcast stations in operation.

The most recent development in the field of locally produced instructional materials has been the use of television by educational groups. One of the first significant undertakings was in 1946, when the New York City board of education presented a variety of student-performed shows.[11] In 1947 the Philadelphia schools started a series of instructional and public relations programs over local commercial television stations.[12] Brooker, in a brief survey, found that by 1950 fourteen school systems were actively engaged in the development of television programs through sustained time made available by commercial stations. He further found that most programs were directed at adult-community audiences, with very few intended strictly for instructional purposes.[13]

On April 14, 1952, the Federal Communications Commission proposed that 10 percent or 242 television channels be reserved as noncommercial educational stations. By 1955, 13 educational stations had gone on the air, and steady growth has taken place since then.

In summary, the development of an interest in and activities concerned with the local preparation of audiovisual materials was marked by early work in still photography and by the preparation of realia of various sorts in connection with school museums. During the 1930's much interest was shown in film-making activities. The results of military and civilian experiences during World War II brought to school people some realization of the values inherent in locally prepared materials to fit specific needs. The use of radio for broadcasting instruction to pupils and to the community did not develop to any stable degree until inexpensive FM facilities allowed for ease and unrestricted operation. Television has been the most recent addition to local production programs. Initial programing was through commercial outlets, and recently the growth of educational and instructional television facilities has been noted.

III. Evidence Supporting Need for Teacher Competencies in Local Production

Historically, a number of survey-type studies and professional recommendations have been made concerning competencies and needs for production experiences in teacher education and in-service education programs.

In 1947, a committee of twenty-six educators from colleges, universities, and selected school systems was appointed by the State Superintendent of Public Instruction in California to investigate the competencies teachers should possess in the field of audiovisual instruction. Among the resulting recommendations were those suggesting that teachers should possess knowledges and skills involved in the production of some of the simpler materials: mounted prints, handmade slides, photographs, filmstrips, posters, charts, graphs, models, collections of natural science materials, and exhibits and displays.[14]

Hite expresses similar recommendations in the Department of Audio-Visual Instruction yearbook: "Each teacher should have some knowledge and skill in preparing appropriate teaching materials for his own level and subject field. These skills might include mounting flat pictures, taking and developing educational photographs or photographic slides, constructing effective displays, exhibits, making graphs, charts, and other drawings, and preparing radio and motion picture scripts."[15]

Noel and Leonard were also convinced that teachers needed to learn skills and to develop abilities in producing such simple materials as mounted prints, slides, posters, charts, graphs, models, and collections of natural science materials and exhibits.[16]

A few brief studies have been made of the opinions of teachers and administrators concerning their evaluation of production training for teachers. Harcleroad contacted the state directors of audiovisual education and received 24 responses to a questionnaire bearing on selection and training of audiovisual personnel. Seven respondents maintained that work in the production of teaching materials was an area of needed preparation, while 5 replies indicated that production work should be considered a special course for all teachers beyond the basic audiovisual course offered in most colleges.[17]

As a result of a questionnaire sent to 238 California school administrators, Svenson found that 55 percent of these educators recommended that pre-service teachers should learn the skills of making simple aids, such as glass slides, and mounting pictures.[18]

Hart recorded the proceedings of the 1940 meeting of the Department of Visual Instruction of the NEA. He synthesized a two-hour discussion on the topic of local production and presented the following generalizations: teachers are especially interested in the production of 2"x2" slides and showed an interest in motion pictures; over one-half of the discussion time was devoted to the making of "kodachromes"; and a major problem pointed out was the need for helping teachers gain the skills necessary to make good materials.[19]

Harcleroad and Allen asked 278 teachers in the San Bernardino (California) county schools for their opinions as to what audiovisual supervisory activities they thought were most valuable to them. Among other things, the results revealed that 75 percent of the teachers were in favor of local workshops on the preparation of teaching materials.[20]

Williams, Zinn, and Snyder expressed strong support for the inclusion of production experiences in pre-service education: "There is no substitute for the direct experience that student teachers must obtain in the production of audiovisual materials if we expect them to make effective use of these materials in their own teaching. Without experience in preparing teaching materials under supervision in a laboratory situation, many student teachers will not realize that such production is comparatively easy. The best guarantee that student teachers will make effective use of these materials in their later teaching is to provide the actual experience in pre-service education programs."[21] Then, Williams, Zinn, and Snyder recommended that three courses in production should be offered as electives to supplement the usual introductory course in audiovisual methods and materials in teacher training. These courses might include

1. preparation of materials that can be handmade: graphic materials, mimeo and liquid stencils, construction of models, plaster, plastics, bulletin boards, exhibits, posters, etc.;
2. elementary photography specifically for the classroom teacher, with emphasis on the use of photography for producing materials for the classroom and with the teaching of two basic skills: ability to take good pictures and ability to make photographic copies of materials useful in teaching; and
3. basic course in radio and motion picture techniques to develop skills in producing simple motion pictures and radio and television programs that would be valuable to the school in its instructional, public relations, and community relations program.[22]

Winston conducted a study of the training of secondary school teachers in the northeast region of the United States in which he found that production skills had been taught in 558 undergraduate, 91 summer undergraduate, 380 graduate, and 211 summer graduate courses for the period 1920-1952. His report indicated that photography and model-making were most often emphasized during this period.[23] As a result of his study he recommended a two-semester undergraduate course in audiovisual production and described its contents.

Non-projected materials

1. Use of small hand tools
2. Construction of dioramas, mock-ups, and models
3. Arrangements of bulletin boards
4. Use of the chalkboard
5. Arrangement and illumination of displays
6. Making recordings
7. Duplicating materials (mimeograph and spirit)
8. Duplicating with blueprinting techniques
9. Preparing maps, charts, and graphs

Projected materials

1. Producing handmade lantern slides
2. Producing overhead transparencies
3. Mounting pictures for projection
4. Photographic skills.[24]

Again turning to teacher-training institutions, de Kieffer studied the distribution of topics in the content of introductory audiovisual courses and reported the percentage of courses which included production topics as compared to the inclusion of other topics.

Percentage of courses including topics of

1.	production of non-photographic aids	63
2.	production of photographic aids	44
3.	radio script-writing and recording	35
4.	other types of production·	21

Percentage of courses including other topics of

1.	utilization of materials	97
2.	selection of materials	96
3.	operation of equipment	95
4.	evaluation of materials	93(25)

An evaluation by Gnaedinger of the same elements of content in audiovisual courses resulted in his statement that "the production of materials of all kinds received secondary emphasis at present in introductory audiovisual courses."[26]

Recently, Torkelson conducted a study of patterns for improving the preparation of pre-service teachers in the use of audiovisual materials, sponsored by the National Defense Education Act. Part of this investigation was a follow-up study of the use of audiovisual materials by these same students when they had acquired teaching positions. By means of classroom observation of 190 participants it was determined that the greatest interest in production was in the areas of spirit duplication, graphs, posters, and charts. Where there were significant differences between elementary and secondary teachers, the secondary teachers produced more in the areas of flat pictures, overhead transparencies, still photographs, 2"x2" slides, models, and motion pictures.[27]

Torkelson also conducted a course effectiveness inventory of 48 items in the audiovisual course to which the teachers responded in terms of "helpfulness" of the items in their teaching. The following production items received the indicated rankings (from 1 to 48):

7 designing bulletin boards;
13 planning chalboard use;
19 visualizing a point to be learned;
23 providing yourself with flat pictures;
25 drawing on the chalkboard;
29 tape recording materials for study;
30 mounting pictures;
44 constructing overhead transparencies.[28]

Finally, Faris and Moldstad conducted a study and prepared a guide on the local production of visual instructional materials. They conducted interviews with teachers and audiovisual specialists in fifteen outstanding programs and indicated several values for teachers as the result of their preparation of instructional materials.

1. As one creates a teaching device, whether bulletin board, display model, slide, or tape recording, he is forced to evaluate the content of his presentation.

2. Since the creator is using his own time, talent, and energy and usually has no one to blame but himself if his message is not communicated, he quickly begins to evaluate the points in his message, decides which points need cues other than those normally given orally, investigates the potential advantages and limitations of each of the many audio-visual media, and proceeds to consider carefully characteristics and needs of his intended audience.
3. Teachers who have experienced the enjoyment and satisfaction of creating a worthwhile instructional aid tend to take pride in using it well.
4. There seems to be a greater inclination on the part of instructors for self-evaluation and the solicitation of student evaluations where locally prepared visuals have been used as part of the presentation than where the presentation is exclusively oral.[29]

On the basis of their study and also experience, Faris and Moldstad recommended that basic components of a local production program should include illustrating, mounting, lettering, coloring, photography, and duplicating.[30]

In summary, it was strongly recommended that teachers should possess competencies in preparing such inexpensive materials as mounted pictures, chalkboard and graphic aids, duplicating stencils, bulletin boards, and models. Introductory college audiovisual courses were not found to give sufficient attention to the production of materials, and both college-level instructors and teachers themselves recommended additional elementary courses or workshops in various phases of audiovisual production which should include, in addition to the above, simple still and motion picture photography, graphic and transparency preparations, and tape recording skills.

IV. Present-Day Justifications for Teacher Competencies in Local Production.

While research evidence and recommendations by writers in the media field give general support for local production competencies, a number of other observations, based on recent developments, strengthen the justifications for preparing teachers to have audiovisual production competencies.

1. New Developments in Educational Methods. In the light of many necessary changes, educational methods in our schools have been undergoing study and careful reappraisal. As a result, such methods as large-group instruction, team teaching, and instruction by television are becoming common practice. Each of these new approaches requires the planning and preparation of a variety of instructional materials to fit specific needs. The responsibility for the planning and often the preparation falls to the teacher who needs the materials. Also, increasing attention is being given to placing more responsibility on students for their own independent learning, as with programed materials. For certain objectives this requires available resources in the form of both printed and/or audiovisual materials. Here again, many of the ideas, plans for, and actual materials must be developed locally.

It might be forcefully stated that the success of such new developments is due in large part to the skills teachers develop in identifying instructional problems and then in selecting or producing the materials that are needed to serve the needs.

2. Growing Needs for Instructional Materials That Have Local Application. Commercially produced audiovisual materials are, of necessity, general in their treatment of a subject since they must interest widespread audiences. There is a growing need for materials that might correlate with commercial items and have meaningful local applications, observations, or interpretations. Also, with increasing attention being given to study and mature consideration of local topics and local problems in our schools, the needs for visual materials will give greater support to local production by teachers and students.

Faris and Moldstad, in their nationwide study of local production programs, gathered evidence to support a number of values for locally produced instructional materials.

> First, the materials can be up-to-the-minute. There is always a considerable time lag between the time an event happens or a new instructional method is introduced and related commercial materials become available to teachers. With adequate production techniques and facilities, a teacher may utilize the map appearing in today's newspaper to make an overhead transparency to project in tomorrow's class. Or pictures from the latest news magazine may provide materials

for a bulletin board display on the newest invention, political development, or economic crisis.

Pioneering teachers can develop visual materials to help in trying out new teaching methods, such as "set theory" in mathematics instruction or the use of visuals in language instruction or in visual testing.

Second, they provide functional flexibility for the teacher and the students. For example, a diagram of the human digestive system might be photographed from a reference book. A large photographic print might be made from the negative for use by a science teacher appearing on television. A number of smaller prints might be included with the lesson outline sent to other classroom teachers who will be conducting the follow-up discussion related to the instruction received via television. 2"x2" slides of this diagram might be sent to each teacher to aid in group re-emphasis, recall, or further study.

Third, local production makes it possible to put the visual content in a form or medium which best suits existing physical and environmental conditions.

Fourth, and perhaps most important, materials can be produced which meet specific local needs of both teachers and students. Johnny becomes much more concerned about soil erosion when he sees photographic examples taken right from his home county--or even from his dad's own land! Geometry problems suddenly become worthwhile when there is visual documentation that the local contractor needs to know angles and use geometric principles to put up the new supermarket.[31]

3. Recent Technological Advances in the Development of Audiovisual Equipment. As equipment becomes less expensive or less complex to use, there is greater interest in using it, and some of its inherent potentials can be realized. This is particularly true of audiovisual equipment for school use. If a unit is too expensive administrators frown upon purchases. If it is too complex to operate teachers are not interested in it.

One piece of equipment that is receiving increasingly extensive support for classroom instruction is the overhead projector. Two recent studies have indicated the accelerated growth in the number of overhead projectors being acquired by schools. In 1961 the Bureau of Social Research reported that the overhead projector was more needed in public school districts than any other type of audiovisual equipment. The percentage of increase indicated by the sampled school districts over the then present number of overhead projectors was 211.5 percent.[32] Almost identical findings were reported in 1964 by Tanzman in his survey on the cost of audiovisual instruction. Between the school years of 1962-63 and 1963-64 an increase in expenditure of 1.9 million dollars for overhead projectors was greater than that for any other audiovisual equipment included in the survey.[33]

Mention is made of these facts that support the growth, in quantity, of overhead projectors because instructional uses for this projector are particularly dependent on locally prepared transparencies, again, most often by teachers. Also, the development of quick, easy-to-use transparency-making equipment like the heat process units (Thermo-fax and other brands) have encouraged even greater use for the overhead projector.

Other graphic arts tools, like dry mount presses and stencil-type (Wrico) lettering aids, permit the easy and rapid preparation of materials that teachers always want. Instructional materials centers in schools are including such items as standard equipment, to be used by teachers, studentts and aides.

Developments in photographic equipment also contribute to growth in local production activities. Simplified slide-making cameras and related automatic slide projectors with remote controls have proven to be the stimuli for many teachers to engage in the production of slides and slide series for their teaching. The availability of high speed color films has eliminated the need for using extra lighting equipment when shooting slides. This is another factor to support the ease of a local production activity.

The door is only now being opened to the potentials of 8mm film for local production. From the single-concept silent cartridge projector to the magnetic sound projector and now to the 8mm optical sound projector, many possibilities for broadening local production activities to better serve instructional needs are being realized. And even more useful developments are assuredly on the horizon. Creative teachers most certainly will be experimenting with and developing valuable materials for teaching purposes.

4. Support Through Publications, Materials, and College Courses. The area of local production in audiovisual (instructional materials) programs of schools and as part of pre-service education programs has only recently been accepted as an integral part of such programs. Possible encouragement, in part, may come through the recognition of and support for this area by various resources.

Textbooks, which offer some direction in a field, are giving increasing recognition to local production. Brown, Lewis, and Harcleroad devote a major portion of their text to the topic "Creating Instructional Materials." Separate chapters treat displays, constructions, recordings, graphics, pictures, transparencies, and photography.[34] One-seventh of Erickson's book is concerned with "Preparing Simple Materials," which include mountings, displays, tapes, slides, transparencies, and motion pictures.[35] Thomas and Swartout's text contains sections dealing with photographed materials, drawn and printed graphics, broadcast and recorded materials, constructed materials, and display materials.[36] Brown and Norberg devote one whole chapter to production services in their media administration book.[37]

Interest in local production for both teaching and training receives further support through the publication of references and texts dealing entirely with production topices. These include the Indiana University and University of Texas publications; books by Hartsell and Veenendaal, Frye, Kemp, Minor, and Morlan; and the company publications by Charles Beseler and Ozalid.[38] In addition, periodicals contribute to this area. Audio-visual Instruction, published by the Department of Audiovisual Instruction, NEA, devoted complete issues in both 1963 and 1964 to local production. The Tecnifax Corporation's Visucom Journal treats the overhead projector and other production techniques, while Eastman Kodak Company offers numerous booklets that motivate and inform educators about photographic methods.

Also of importance to the local production movement are the film series produced by Indiana University and Iowa State University as well as commercial film producers. Recently, self-instruction in production competencies has been aided by 8mm single-concept films from Instructional Media Productions.

The Educational Media Council compiled a directory of 1965 summer courses on educational media (printed in the April, 1965 issue of Audio-visual Instruction). Among the 340 institutions reported as offering summer courses, 136 of them included work in still photography, graphics, or motion pictures. Thus, over one-third of the colleges and universities over the country recognized the need for graduate and undergraduate courses in this area.

Finally, recognition should be given to the workshops offered to teacher groups under the National Defense Education Act and the extensive program in local production developed and implemented in Texas. Superintendents, principals and supervisors have participated in the Texas workshops throughout the state, with the reasoning that they would be in positions to expedite the training of teachers in their own school systems. Reports indicate that this has been a successful approach to developing competencies with teachers.[39]

V. Competencies for Teachers in Local Production

Before considering specific competencies we must recognize the values to teachers of the "process of planning and production" over and above the worth of the materials they prepare. Whenever a teacher, possibly with professional assistance, begins to think about and plan needed materials, a number of factors come into play that may have direct bearing on the improvement of her teaching. First, careful attention is given to the subject content under consideration. Details must be checked for accuracy and completeness. Organization must be logical. Careful thought is given to the potential audience, the viewer or user of the materials, and to the materials: how sophisticated? what vocabulary level? how fast paced? how many examples are needed? These and other elements become all important and may require a more careful study of characteristics of the audience group. Also, the manner of organizing and presenting the content, as based on effective learning and perception principles, becomes very important as the more advanced types of instructional materials are planned (slides, motion pictures, television programs, and so forth). Thus, the process of production has a bearing on other aspects of teacher abilities. Having to define, examine, clarify, and apply these factors in planning for locally prepared materials may contribute to the general improvement of teaching.

In making selections of specific competencies and experiences in production for teachers, we must consider two factors: first, the variety of such experiences; second, the depth to which each skill should be treated.

With respect to variety, as based on research and other evidence, on recommendations, and on experience, production competencies can be organized into a basic group, important to all teachers, and into an optional group, valuable to some, on a voluntary-interest and need basis. This latter group would include some of the more technical skills in graphic arts, photography, sound recording, and so forth. Recognition needs to be given to activities in certain subjects (primary grades, sciences, and so forth) that develop special skills for preparing materials unique to the area (models, plastic embedding, sand table constructions, and so forth). These latter competencies are not direct concerns of this paper but are noted only as important to certain teaching areas and are recommended for treatment in subject methods courses.

The second consideration noted above is the depth of experience to be provided in developing competencies. Here, thought must be given to school situations, present and future. At present in most public schools teachers interested in preparing their own teaching materials must perform the total job themselves, meaning both planning and preparation. In only a limited number of schools do we find technicians, teacher aides, or secretaries assisting teachers with the mechanics of preparing materials. Some teachers may rely on students for assistance with the routine of some types of production work (picture-mounting, slide-making on a copy-stand, running transparencies, and so forth). In schools with well-developed audiovisual programs extensive assistance may be provided teachers through the student projection club or audiovisual class.

As more attention is given to providing teachers and teaching teams with assistance, the responsibility of the individual teacher for doing routine media preparation work will be reduced. Eventually, the teacher's role principally will be one of deciding what resources are needed to serve instructional objectives, selecting appropriate media, planning the content, and establishing other requirements for specific materials, such as use of color, order of presenting information, and preparation of correlated items. These are some of the factors in the "production process" referred to previously. The actual preparation work then will be done by a technical staff member.

But for the present, those teachers who wish to have their own materials must, in large majority, know and be able to practice the complete skill of a process for success of final results. It is also felt that even as technical assistance is provided, teachers still must be acquainted with the details of the important production processes in order to properly develop their plans and to converse with their assistants and advise them on procedures.

1. Basic Competencies. On the basis of the foregoing, both teacher education students and teachers in service should acquire the basic competencies, as expressed in behavioral terms.

a. Conceptual skills

(1) Establish purposes for materials

To list the specific instructional purposes (in behavioral terms, as possible) to be served by materials that are needed for teaching

(2) Plan materials

To describe or sketch the visual treatment of materials, considering content, design, color, and method of use factors

(3) Evaluate materials

To state the factors for consideration during evaluation of the instructional effectiveness of materials

(4) Involve students

To plan how to involve students in preparation of appropriate materials

b. Manipulative skills

(1) Using the chalkboard

To write large, legibly, and in straight lines

To use colored chalk as appropriate for giving emphasis, showing relationships, or indicating aspects of a visual

To keep a chalkboard in proper condition

To apply sketching techniques as needed

To organize information on the chalkboard in pleasing, effective designs

To make and use such chalkboard aids as templates, disclosure devices, and opaque enlargement

(2) Cartooning and simple sketching

To draw stick figures, heads with various expressions, and simple objects, all using felt pens

To apply these techniques in developing a series of illustrations treating a content topic

(3) Mounting pictorial materials

To gather pictures from magazines and from other free and inexpensive sources

To build a picture file

To mount pictures on cardboard using rubber cement (temporary and permanent methods) and using dry mount tissue (dry mount press and electric hand iron)

To mount large maps or charts on dry mount cloth

(4) Lettering

To practice lettering with felt pens, prepared letters, and stencil guides until a satisfactory degree of proficiency is reached

To use these lettering aids in preparing such materials as flip charts, flash cards, lists, directions, or name cards

(5) Making displays

To use mounting techniques, lettering aids, and sketching skills to prepare posters and charts

To prepare materials for use with at least one type of "teaching board" (flannel, felt, magnetic, or hook-and loop)

(6) Duplicating printed materials

To prepare spirit duplicator and make copies, on paper, from masters

(7) Recording on tape

To plan and prepare tape recordings that treat instructional topics and require one voice, then multiple voices with dubbings from parts of disc recordings or other tape recordings

(8) Making transparencies

To plan and prepare transparencies (single sheet and overlays) for overhead projection using these methods: felt pens and marking pencils directly on acetate, heat process (Thermo-fax or equal), spirit masters on frosted acetate, and diazo (ammonia) process.

2. Optional Competencies. While the above basic production competencies should be of importance to both teacher education students and in-service teachers, there are a number of somewhat more advanced techniques that may be of particular value to practicing teachers. Obviously, all teachers will not find all of these techniques of value, nor will they have the skills, equipment, and facilities available to utilize all of them. But it is advantageous for both students and teachers to be made aware of these methods. Therefore, as many of these competencies as possible should be introduced, by means of example and demonstration, in teacher education and in-service education programs.

Those optional competencies that interest students or teachers in a group should be examined in greater detail, and experiences provided by practice or completion of useful projects.

a. Conceptual skills

(1) To plan for solutions to instructional problems that involve visual materials by

Identifying the problem and stating the objectives to be served in student behavioral terms

Identifying the characteristics of the audience that may bear on the materials

Listing the subject content to be considered

Selecting the appropriate medium or media to treat the topic

Preparing a script, storyboard, or detailed analysis of content prior to visualization

(2) To plan for the involvement of students in the planning and production of the materials

(3) To plan for the utilization of materials prepared

b. Manipulative skills

(1) Photographic slides

To make slides of a variety of interior and exterior subjects

To copy pictures and other printed materials onto film

To plan and prepare a slide series treating a single topic

(2) Photographic transparencies and black-and-white study prints

To copy printed or prepared black-and-white materials of various sizes onto film to make negatives

To print the negatives, using an enlarger, to make transparencies and prints

(3) Polaroid prints and slides

To prepare "instant" photographs and slides using a Polaroid camera

(4) Motion pictures (8mm silent and/or sound)

To plan the content for a film using the procedures listed under "Conceptual Skills" above

To film the subject, using satisfactory motion picture techniques

To edit the film

To add sound, as required

To demonstrate utilization of the film

(5) Laminating pictorial materials

To apply laminating film over the surface of mounted and unmounted pictures

(6) Exhibits and models

To plan and prepare simple models, cutaways, and mock-ups

To design and prepare displays and three-dimensional exhibits

(7) Recordings

To prepare recordings that accompany slide series or motion pictures

To prepare recordings for classroom lessons or independent student learning

(8) Radio

To plan and script an instructional radio program

To present the program with or without the assistance of students

(9) Printed materials

To plan the preparation of a manual, guide, workbook, or other printed instructional material

To write and edit the manual

To locate or prepare the visuals

(10) Masters and paste-ups

To prepare masters (requiring paste-up of lettering and visuals) for offset duplication

To make use of mechanical lettering devices (Leroy, Varigraph, and others) and photocomposing equipment (Headliner, Stripprinter, Protype)

To observe the process of offset plate-making and offset press operation

(11) Television

To plan and script an instructional television program

To prepare the materials for the program

To participate in the production of the program

3. Special Subject Competencies. In some subject areas, as noted on page 147, special attention is given to certain production skills. Such experiences usually are provided in the subject method courses or by

supervisors of subject teaching areas. Although such competencies are not considered as part of this paper, some examples may be given.

a. Natural and physical sciences
   - constructing models
   - embedding objects in plastic
   - building dioramas
   - laminating leaves and other objects
   - developing aquaria and terraria
   - making demonstration devices
   - etc.

b. Primary grades
   - constructing sand table scenes
   - making puppets
   - building dioramas
   - working with papier-mâché
   - constructing mobiles
   - making objects in clay
   - etc.

VI. Developing The Competencies in Local Production

It is now necessary to examine how instruction in the basic and optional production competencies can take place. Consideration will be given, first, to teacher education courses which may include these competencies and, second, to the methods of instruction.

1. College Courses. In teacher education there are five ways in which experiences with production techniques may take place.

   a. In the audiovisual (instructional technology) utilization course

   (1) Production competencies developed as equipment studied

   Picture mounting with the opaque projector

   Transparency preparation with the overhead projector

   Recordings with the tape recorder

   etc.

   (2) Production competencies developed as various media considered

   Chalkboard and display unit

   Non-projected graphic materials

   Filmstrips and slides

   Motion pictures

   etc.

   b. In the professional methods courses as teaching applications of media are considered and experiences with production competencies are integrated through assignments, reports, projects, and so forth

   c. In the subject area methods courses, such as science or mathematics, as teaching applications of media are considered

   d. In a separate production course--or as separate production units within the above three course areas--in which basic competencies are taught and the optional ones are introduced

e. If none of the above four approaches to the handling of production competencies is possible within an institution, then special orientation sessions arranged for and conducted by a qualified media person; follow-up workshop sessions for student activity highly desirable.

As an evaluation of the above five approaches in teacher education, present experience strongly indicates that the more successful methods of handling production experiences are the separate audiovisual course and the direct production course. If an institution offered a utilization-production course combination (for five semester units of credit) the best results could be expected. Unfortunately, most instructors in professional and subject methods courses do not have the background to teach production work, do not have the time to include it (by asking a qualified colleague to meet the class), or do not feel it is an important enough area to include in their courses. Orientation sessions unless carefully planned with adequate follow-up experiences, may be just of incidental and passing value for students.

It should be realized that the successful development of these production competencies cannot stop with the conclusion of a classroom or laboratory course. Workroom facilities for student use should be provided for repeated follow-up activities and special opportunities to practice these new skills.

For teachers in the field, production competencies can be developed best in several ways.

a. Special school systems-sponsored in-service courses, institutes, and workshops treating specific production techniques with provision for follow-up classroom applications, available equipment and materials, and necessary assistance

Mention should again be made at this time of the successful workshops for school people conducted by Frye and others at the University of Texas.[40] Also, recognition is given to the NDEA-sponsored project by Williams and others at Ohio State University to provide kits of demonstration and workshop materials for school faculty self-instruction in media utilization and production.[41]

b. Instruction and supervision of teachers by qualified media specialists in individual schools

c. College- and university-sponsored campus and extension production courses.

2. Methods of Instruction. The traditional method of instruction in production competencies involves an introduction to a technique, frequently with a 16mm film (Indiana, Iowa, or other source); then teacher demonstration of the technique before the class; and finally, student-assigned projects in a laboratory situation.

Within the last few years some educators have experimented with self-instructional approaches for teaching production competencies. At San Jose State College 8mm concept films for use with the Technicolor Instant Movie projector correlated with film information sheets and text references have proved satisfactory. At Arizona State University 8mm films somewhat more highly structured and paced have been used.[42] At the University of Connecticut a carefully programed approach involving 8mm films, slides, and printed materials is successfully used.[43] Other institutions are no doubt using similar or possibly other approaches, but the author is most familiar with those mentioned.

These experiments, while not treated as formal research projects, indicate that a self-instructional method for teaching manipulative-type production competencies might very well replace the traditional teacher-demonstration approach. Some apparent advantages of these new methods might be listed.

a. Students have greater responsibility for their own learning, which is in keeping with modern instructional methods.

b. Students proceed at their own rate, using materials carefully designed to serve particular objectives.

c. Students may review the materials or have the flexibility to study techniques as many times as necessary, as opposed to a one-time demonstration that in itself is of questionable effectiveness.

d. Professional time for presenting simple, routine skills may be reduced and laboratory supervision handled by assistants, who themselves have learned standardized methods from the self-instructional materials.

e. Self-instructional methods lead to flexibility in scheduling the use of facilities with the result that such facilities can be used more efficiently.

f. A self-instructional approach generally proves to be a pleasant, enjoyable experience for the student.

g. The self-instructional approach can serve as an example for teachers as well as for students of how they might devise programs for teaching manipulative skills as independent learning experiences for their own students.

A word of caution needs to be sounded as the newer self-instructional approach is advocated over the traditional teacher-demonstration method. It is not looked on as the sole way of developing all competencies required in the production area. There are other important things, like the conceptual skills, that must be developed through group interaction. The Torkelson report, investigating the effectiveness of a variety of approaches for preparing pre-service teachers to use audiovisual materials, considered a self-instructional method to teach audiovisual equipment operation, as manipulative skills related to teaching production techniques. The method proved to have merit, but one of Torkelson's recommendations was as follows: "...the answer to the use of self-instructional approaches to information acquisition and conceptualization lies in some combination of the self-instructional approach for certain types of information with seminars for discussion of audiovisual applications to the learning process."[44]

Transferring this recommendation to the present topic means that it may be possible to teach the mechanics of production skills through the use of carefully designed self-instructional materials, but it is also important to include group sessions, conducted by qualified professional staff, in order to introduce topics, to motivate students prior to laboratory activity, to illustrate planning practices, to point out relations of production techniques to other aspects of teaching, to discuss sources of materials, to answer questions, and to provide follow-up evaluations and utilization experiences.

Finally, it is strongly encouraged that pre-service students be provided with planned opportunities to apply the production skills they have developed by preparing materials, in the workroom provided, and by practicing follow-up utilization of the materials in classroom reports and for other activities in teaching subject area courses as well as in professional classes. Obviously, this will require understanding and cooperation from other instructors. But the effort should be worthwhile as students are led to realize the value of production experienced by serving their own needs. The same sort of practical follow-up opportunities, with support of equipment and materials (and released time for major projects, if possible), should be available to in-service teachers after their initial experiences with production competencies.

FOOTNOTES

1. Carl G. Rathman, Visual Education in the St. Louis Museum, U. S. Bureau of Education Bulletin, No. 39 (Washington, D. C., 1925), pp. 28-29.

2. Charles Roach, "Visual Instruction Services in a City System" (abstract), in Proceedings of the Sixty-seventh Annual Meeting (Washington, D. C.: National Education Association, 1929), pp. 942-943.

3. Cline M. Koon, School Use of Visual Aids, U. S. Office of Education Bulletin, No. 4 (Washington, D. C., 1938), p. 54.

4. Edgar Dale, "Film Production in Schools," in Motion Pictures in Education: A Summary of the Literature, compiled by Edgar Dale et al. (New York: The H. W. Wilson Co., 1938), pp. 271-303.

5. Floyde E. Brooker and Eugene H. Herrington, Motion Pictures in Education, Vol. V: Students Make Motion Pictures: A Report on Film Production in the Denver Schools, American Council on Education Studies, Series 2, No. 7 (Washington, D. C., May, 1941); Eleanor D. Childs and Hardy R. Finch, Producing School Movies: A Manual for Teachers and Students Interested in Producing Amateur Films (Chicago, Illinois: Committee on Standards for Motion Pictures and Newspapers, National Council of Teachers of English, 1941); William G. Hart and Roy Wenger, Modern Media of Education, Vol. I: Making School Movies, Bureau of Educational Research, The Ohio State University, Series 1, No. 4 (Columbus, Ohio, June, 1941).

6. Hardy Finch served from February, 1940 to March, 1946 (Vols. XIX to XXIV); David Schneider, from June, 1945 to May, 1948 (Vols. XXIV to XXVII).

7. John R. Miles and Charles R. Spain, Audio-Visual Aids in the Armed Services (Washington, D. C.: American Council on Education, 1949), p. 33.

8. Ibid., p. 81

9. William A. Swick, Jr., "The Empire State FM School of the Air," Educational Screen, XXIX (1950), 158.

10. Morris A. Shirts, "The Growing School Administrative Problem of Wireless Communication," unpublished dissertation (Indiana University, 1952), p. 91.

11. See William H. Knowles, "Television in Education," The School Executive, LXVIII (1949), 46.

12. See Martha A. Gables, "Two Years of Pioneering Show Instructional and Public Relations Value of Television," The Nation's Schools, XLIII (1949), 56.

13. Floyde E. Brooker, "How Television Is Progressing in Schools," The School Executive, LXIX (1950), 67-69.

14. California State Department of Education, "Developing Standards of Teacher Competency in Audio-Visual Education," California Schools, XVIII (1947), 3-6.

15. Herbert Hite, "Supervision and In-Service Education," in The School Administrator and His Audio-Visual Program, ed. Charles F. Schuller (Washington, D. C.: Department of Audio-Visual Instruction, National Education Association, 1954), p. 166.

16. Elizabeth G. Noel and J. Paul Leonard, Motion Pictures in Education, Vol. XI: Foundations for Teacher Education in Audio-Visual Instruction, American Council on Education Studies, Series 2, No. 9 (Washington, D. C., June, 1947), pp. 2-3.

17. Fred F. Harcleroad, "The Selection and Education of Audio-Visual Personnel," in The School Administrator and His Audio-Visual Program, ed. Charles F. Schuller (Washington, D. C.: Department of Audio-Visual Instruction, National Education Association, 1954), pp. 131 and 134.

18. Leonard E. Svenson, "Pre-Service Teaching Training in Audio-Visual Education," unpublished thesis (University of Southern California, 1947), p. 94.

19. William G. Hart, "The Present Situation in School-Made Films," Educational Screen, XIX (1940), 154-155.

20. Fred F. Harcleroad and William Allen, Audio-Visual Administration (Dubuque, Iowa: William C. Brown Co., 1951), pp. 76-77.

21. Don G. Williams, W. Roger Zinn, and Luella Snyder, "The Production of Audio-Visual Materials in Programs of Teacher Education," in Audio-Visual Materials in Teacher Education (Lock Haven Pennsylvania: Association for Student Teaching, State Teachers College, 1950), p. 63.

22. Ibid., p. 69.

23. Fred Winston, *A Study of the Development of Teacher Training in the Skills for the Production of Audio-Visual Instructional Materials* (New York: New York University, 1960), p. 183.

24. *Ibid*., pp. 193-195.

25. Robert E. deKeiffer, "The Status of Teacher Training in Audio-Visual Education in the Forty-eight States," unpublished dissertation (State University of Iowa, 1948), pp. 79-81.

26. William G. Gnaedinger, "Pre-Service Teacher Education for Use of Audio-Visual Instructional Materials," in *Audio-Visual Materials of Instruction*, forty-eighth yearbook of the National Society for the Study of Education, Part 1 (Chicago, Illinois: University of Chicago Press, 1949), p. 98.

27. G. M. Torkelson, *An Experimental Study of Patterns for Improving the Preparation of Pre-Service Teachers in the Use of Audiovisual Materials and of Effects on Pupils*, (The Pennsylvania State University, 1965), p. 122.

28. *Ibid*., pp. 134-135.

29. Gene Faris and John Moldstad, *Improving the Learning Environment: A Study of the Local Preparation of Visual Instructional Materials*, U. S. Office of Education Circular, No. 718 (Washington, D. C., 1963), pp. 10-11.

30. *Ibid*., pp. 115-116.

31. *Ibid*., pp. 9-10.

32. Eleanor Godfrey, "Audiovisual Equipment and Materials in U. S. Public School Districts--Spring 1961," preliminary tabulation prepared for U. S. Office of Education, Bureau of Social Science Research, Inc.

33. Jack Tanzman, "The Cost of Audio-Visual Instruction, 1962-63/1963-64," *School Management*, XLVI (1964), 82-93.

34. James W. Brown, Richard B. Lewis, and Fred F. Harcleroad, *AV Instructional Materials and Methods* (New York: McGraw-Hill Book Company, 1964).

35. Carleton H. W. Erickson, *Fundamentals of Teaching with Audiovisual Technology* (New York: The Macmillan Co., 1965).

36. R. Murray Thomas and Sherwin Swartout, Integrated Teaching Materials (New York: Longmans, Green and Company, 1960).

37. James W. Brown and Kenneth Norberg, Administrating Educational Media (New York: McGraw-Hill Book Company, 1964).

38. Indiana University, Audio-Visual Center, A-V Materials Handbook (Bloomington, Indiana: Indiana University, 1962); University of Texas, Bridge for Ideas, series of booklets on local production (Austin, Texas: The Visual Instruction Bureau,); Horace Hartsell and Wilfred Veenendaal, Overhead Projection (Buffalo, New York: American Optical Company, 1960); Roy A. Frye, Graphic Tools for Teachers (Austin, Texas: E & I Printing Company, 1964); Jerrold E. Kemp, Planning and Producing Audiovisual Materials (San Francisco, California: Chandler Publishing Company, 1963); Edward O. Minor, Simplified Techniques for Preparing Visual Instructional Materials (New York: McGraw-Hill Book Company, 1962); John E. Morlan, Preparation of Inexpensive Teaching Materials (San Francisco, California: Chandler Publishing Company, 1963); Vu-Graphics: A Manual on Vu-graph Projectors (East Orange, New Jersey: Charles Beseler Company, 1952); Ozalid Audio-Visual Department, They See What You Mean: Visual Communication with the Overhead Projector (Johnson City, New York: Ozalid, 1959).

39. Roy A. Frye, "Inexpensive Materials Workshop," Educational Resources and Techniques, II (1962), 2-3, 12-13.

40. Ibid.

41. See Catharine M. Williams, "Packaged Program for In-Service Audiovisual Education," Audiovisual Instruction, X (1965), 552-555.

42. See Vernon S. Gerlach, "A Unique Partnership Via 8mm," Educational Screen and Audiovisual Guide, XLIII (1964), 588-589.

43. See David H. Curl, "Automated Equipment Operation Training," Audiovisual Instruction, X (1965), 564-565.

44. Torkelson, pp. 71-72.

CHAPTER VII

EDITOR'S COMMENT ON TORKELSON'S PAPER

The Torkelson paper contains a body of very useful information and background material about media and teacher education. Those individuals who are familiar with this area or who may not be interested in an extensive discussion of it may want to turn to the section entitled "A Plan for Developing Competencies."

In the section on developing competencies, Torkelson proposes a new program of teacher education. Some persons believe that the scheme is as "utopian" or as "bold" as Torkelson indicates. The fact is that there are many bits and pieces of such a program in operation around the country at the present time. Torkelson is certainly correct in postulating, however, that no one has built a complete program of teacher education around the model which he proposes.

Fortunately, Torkelson's paper ends on the exact theme which this whole report reflects. It is that we look upon all persons as learners: students at the elementary-secondary level, students in teacher education programs, and the teachers who teach each of these groups. Torkelson suggests further that we determine the kinds of behavior which we want each group of learners to exemplify and that through laboratories we provide the resources which make it possible for each to learn. The idea is so intriguing and so simple that one wonders why it was not long ago suggested, tried out, and validated or rejected. The only person who has come close to developing such a system as Torkelson proposes is Dr. Sam Postlewait, who, incidentally, is not a professor of education but a professor of botany. The great success which Postlewait has enjoyed with his learning laboratory would suggest that it is applicable in many other fields, including professional education and the education of teachers.

An additional dimension of the Torkelson approach is what he calls the "analytical stage." Although he does not expand on the idea at any great length, he proposes that after learners have tried out certain kinds of experiences they be required to verbalize and conceptualize from the literature and research the rationale and the reasons why it is supposed to be successful. Thus, the students would be required to go through a series of intellectual manipulations to justify the procedures on the basis of the speculative, theoretical, or research literature.

COMPETENCIES NEEDED BY TEACHERS IN THE USE OF NEWER MEDIA AND VARIOUS APPROACHES TO ACHIEVING THEM

G. M. Torkelson*

The purpose of this paper is to discuss several approaches for developing teacher competencies in the use of aural-visual materials and equipment and to suggest yet another plan for realizing these competencies. Before this can be done, however, it will be necessary to set the stage by tracing a brief history of concern for these competencies, by describing what some of these competencies are presumed to be, and by citing various experimental studies relevant to the general topic. In addition there will be some discussion of the learning and teaching processes as these may contribute to the design of a teacher preparation program.

One of the great problems in delineating the competencies in question is that educators generally have found it difficult to predict the teaching act from theoretical constructs of what the teacher ought to do. Consequently, various investigators are turning their attention to the recording of teacher performance as it actually occurs. This approach is deemed to be potentially more profitable in determining teacher preparation than the more traditional theorizing about how a teacher should behave.

Simply describing what the teacher does as a basis for teacher preparation, however, may not offer the necessary directions for the media

---

*Professor of Education, University of Washington, Seattle, Washington field. Current evidence seems to substantiate limited use of a wide variety of media by a great segment of the teaching force. Recording absence of use will not offer suggestions for teacher preparation unless reasons for this lack of use are also obtained.

Perhaps some directions for the preparation of teachers in media may come from the current efforts to describe teacher behavior. Equally important, however, will be new approaches to teacher preparation which attempt new ways to put theories into practice. This paper will touch on some of the problems associated with this latter approach.

I. Historical Background

The concern historically with preparing teachers for competency in the use of aural-visual materials and devices may be characterized in three broad time periods.

The first period concerns the early beginnings of audiovisual education in this country and is included to underscore the fact that teacher preparation faculties have been concerned from the beginning about the efficient use by teachers of various pedagogical tools. As newer types of materials and devices became available in greater quantities, concern for the development of teacher competencies also grew. Today, this special effort is marked by the existence of the Commission on Teacher Education of the Department of Audiovisual Instruction.

The second period may be characterized as the time during which formal attempts were made to spell out the special competencies teachers were expected to possess.

The third period encompasses contemporary times, marked by research and special emphasis upon teacher preparation for the competencies in question.

1. Early Beginnings. Pennsylvania was the first state to require that teachers have "an approved course in visual and other sensory techniques."[1] As early as 1925, C. F. Hoban, Director, Visual Education, Division of the Department of Public Instruction, had urged the inclusion of courses in visual instruction in all teacher training institutions. The requirement was established by a ruling of the State Council on Education in 1934.

During this early period a number of publications were also produced to assist the teacher in acquiring competencies: William H. Johnson, _Fundamentals in Visual Instruction_ (1927); Anna V. Dorris, _Visual Instruction in the Public Schools_ (1928); and Hoban, Hoban, and Zisman, _Visualizing the Curriculum_ (1937).

Assistance to teachers in the schools in the use of audiovisual materials seems to have predated formalized pre-service preparation. For example, the St. Louis public schools date their audiovisual division from 1904, a loan division developed as a result of the World's Fair in St. Louis. By 1917, the St. Louis division was distributing 35mm films to the schools in a horse-drawn wagon. In Philadelphia, the museum service to schools also dates from this earlier period.

In February, 1932, the Department of Visual Instruction of the National Education Association was joined by the Visual Instruction

Association of America (founded in 1920) to form the Department of Audio-Visual Instruction.

In 1946, a ruling was passed in California requiring an audiovisual course for teachers (more recently rescinded).

By 1957, audiovisual instruction was required by 26 percent of the 293 institutions affiliated with the National Council for Accreditation of Teacher Education. Twenty percent of the institutions required audiovisual training in the secondary curriculum.

In 1957, deKeiffer surveyed 1097 colleges and universities, receiving responses from 85 percent or 898 institutions. Audiovisual programs were offered in 560 institutions, for a total of 846 courses. Fourteen percent reported formally organized audiovisual departments. Twenty three percent recognized audiovisual education as an area of graduate study.

These few and incomplete recitations are included to indicate that the period of present concern for teacher competencies has a history of about a half a century in some form or another. To make the picture more complete, we could discuss the origins of visual communications in early man and the contributions of Comenius, Pestalozzi, Montessori, and others. The important point to make, however, is not so much that concern for teacher competency is of long duration but that teacher competency in the use of aural-visual media still remains a problem. In fact, with the great advances in educational technology, with the tremendous impetus toward media availability given by the National Defense Education Act, with the recent provisions for media institutes under NDEA, Title XI, and with other national legislation with important support for the use of media in public education, the problem of preparing teachers to use media has become extremely urgent.

2. Guidelines for Competency. One of the early attempts to systematically identify teacher competencies in the use of media was a statement by the American Council on Education in 1947.[2] In the same year, the California State Department of Education published a similar list in California Schools.

In 1950, the DAVI Committee on the Accreditation of Secondary Schools published Evaluative Criteria for Audio-Visual Instructional Materials Services. This instrument was designed as part of the criteria in the Cooperative Study of Secondary School Standards. By implication, at least, it subscribed to a need for upgrading teacher competency in audiovisual use by urging adequate facilities and materials.

In 1957, David Pascoe, then audiovisual consultant to the State of California, conducted a questionnaire study which assessed the value of the California Standards of 1947 which had been used in the basic audiovisual courses during the years after 1947. Teacher competencies are implied by the content of the questionnaire. Under the heading Knowledges and Understandings were listed the following: Principles of Use, Selection of Materials, Types of Materials and Equipment, Sources of Materials and Equipment, Services of the Audio-Visual Department, Materials for Specialists, Production of Materials, Results of Research, Single School Services, Administering of Aids, and History of Audio-Visual. Under

Skills and Abilities were listed these items: Utilization Selection, Evaluation of Uses, Equipment Operation, Appraisal, Display, Production, Best Physical Conditions, and Field Trip.[3]

Following closely on the heels of Pascoe's study were two other events of significance in helping educators to focus upon the preparation of teachers in the use of media. One was the passage of the National Defense Education Act of 1958, the implications of which are evident today without elaboration.

The other event was the 1958 Lake Okoboji (Iowa) Audio-Visual Leadership Conference, at which Pascoe reported his findings. As reported by Allen, the conference "devoted its major effort to the consideration of the problems of pre-service teacher preparation in audio-visual competencies. It was not [its] intent...to develop or recommend teacher education programs or, indeed, specific courses...[rather, it] attempted to develop a list of audio-visual competencies to be expected of teachers going into service. The Conference also suggested a frame of reference in terms of philosophy and psychology of the curriculum; and has suggested, by way of illustration, several approaches to the problem of achieving these audio-visual competencies in teachers."[4]

The conferees then proceeded to develop basic statements of belief and to suggest the content of teacher preparation to assure these competencies. The basic principles of curriculum planning were thought to be the desired approach for the improvement of the teacher preparation programs in this area.

The prime objectives prescribed by the conferees for the pre-service program were the development of "visual mindedness, the stimulation of creative imagination, and the encouragement of enlightened resourcefulness."[5]

The suggested "foundations" for the pre-service program were as follows: knowledge of background and associated philosophical and psychological factors; the relationship of audiovisual to the curriculum; the nature and limitations of audiovisual devices; administrative aspects of audiovisual programs; and desirable attitudes.

To develop the desirable skills, knowledges, and abilities, the conferees suggested six areas for study: diagnoses of learning problems; knowledge of materials and equipment; experience in selection and use; skill in preparation of materials; competency in equipment operation; and training in evaluation.

The conferees further examined the pros and cons of four patterns for achieving these competencies: the completely integrated approach; the integrated materials-methods course; the formal course approach; and the laboratory project approach. A fifth pattern was considered as a combination of certain aspects of the previous four.

Stimulated by the Okoboji Conference, the Department of Audio-Visual Instruction, NEA, devoted the January, 1959 issue of Audio-Visual Instruction to the subject of teacher education. This issue contained reports from colleges and universities which pursued various patterns considered at the Okoboji Conference. As Dr. Hyer, Executive Secretary, DAVI, stated in her editorial, "Development of AV competencies is to be priority concern for

DAVI national and, we hope, for states, organizations, and the individual members during 1959....Concentrated attention to improved methods of developing AV competencies in the teacher education program is long overdue. Administrators tell me that today teachers are little better prepared to use AV materials than they were ten years ago."

During the same month, January, 1959, the Phi Delta Kappan published an article by Fulton and White, prepared at the request of the Audio-Visual Commission on Public Information, entitled "What Constitutes Teacher Competence in Audio-Visual Communication?" The authors reported general consensus in the field that teacher competency in selection and use of audiovisual materials could be grouped under four headings: (a) selection and evaluation of materials; (b) utilization of appropriate instructional materials; (c) production of simple instructional materials; and (d) preparation and use of physical facilities.

3. Studies of Teacher Competency. Overlapping the development of these guidelines was a period from the middle 1940's to the present characterized by formalized study of the general problem of teacher competency and of teacher preparation.

Up to 1959, according to Allen, "The research in the area of teacher education to utilize new educational media with maximum effectiveness is characterized by status studies and questionnaire surveys. Practically no experimental research has been conducted on ways to train teachers, either in colleges or universities or in in-service training situations."[6]

The major conclusions from the evaluation type surveys, according to Allen, were that (a) teacher inertia is an outstanding deterrent to the use of media, (2) a small percentage of the teachers use the greatest percentage of materials, and (c) teachers with preparation used more media and with greater effectiveness. To one degree or another, with some variations, these findings in general are confirmed by the studies of Hite,[7] Hyer,[8] Imbrock,[9] Meiser,[10] White,[11] Benda,[12] Camp,[13] Reed,[14] and Harris.[15]

A few more recent studies of utilization underscore essentially the same conclusions of the earlier investigators and of the 1957 survey of the National Education Association. This latter study showed that about 50 percent of the teachers surveyed lacked confidence in the use of audiovisual materials and equipment.[16] An even earlier survey by the same organization in 1953 and 1954 indicated that less than 10 percent of urban school districts surveyed required competence in the audiovisual area of their new teachers.[17]

A survey by Oliver of educational media used in the State of Georgia (1959-1960), including 36 percent of the school systems, 28 percent of the schools, and 16 percent of the teachers, indicated that in the systems surveyed

a. school administrators lack information about media and their use in teaching;

b. regardless of the media available, teachers depended quite largely on printed media;

c. according to national and State of Georgia norms, the availability of equipment was inadequate;

d. building needs to facilitate use are not met;

e. administrators blame meagre use to teacher lack of requisite knowledge and skills and to inadequate teacher preparation; and

f. teachers emphasize administrative and physical facility details as major deterrents.[18]

This survey was part of a larger project (July, 1959-September, 1962) during which the effects of training versus non-training of pre-service teachers to use media were compared in the actual teaching situation. Generally speaking, pre-service preparation resulted in greater and more effective use of media. The recommended content for pre-service teacher preparation, as suggested by those who supervised student teachers, emphasized the selection and utilization of media as being more important than the physical nature of media and emphasis upon research findings.

In 1961, Godfrey sampled the availability and use of audiovisual media in public schools, drawing data with a sampling technique from among 2500 school districts in the United States. Her conclusions, based on 11,531 teachers and 572 schools in 250 school districts, were that "the teachers... reported a high level of technical competence and a knowledge of the field through either college work or in-service training. Most of them are interested enough to suggest that the schools rent or buy new materials or equipment. The basic equipment is available for their use in their own school building. *Yet the majority of them do not use audio-visual media extensively, nor do they plan to do so in the near future*."[19] (My underlining.)

It is interesting to note in passing that Godfrey's findings suggest adequate amounts of materials and equipment in the schools she surveyed.

It is not determined whether this was due to NDEA, Title III acquisitions or to overestimates by those who provided the information. If, on the other hand, we accept the sample of the study as being truly representative of the total population and media are available in adequate quantity, then why is it that the teachers do not intend to use audiovisual materials extensively in the future? An answer to this question was not offered by the study.

Another sample of teachers who do not use media extensively is offered through the observations of Lathrop and Beal, gathered during visits to selected campus schools in the United States during 1964. They were "struck by the almost complete absence of innovative ideas about the use of new media in teacher education....By and large, most campus school staffs had not developed the use of new media to any greater degree than could be found in the typical public school."[20]

Between 1959-1963 Torkelson conducted a study comparing four patterns for preparing pre-service teachers to use media. The four patterns were the separate course, integration with methods, self-study, and student teaching while on location in schools in Pennsylvania. The study involved two years of presenting the four patterns and two years of visiting 235 graduates of the project in 196 schools in Pennsylvania. Pertinent to this paper, the study suggested several conclusions.

> In terms of the teaching of equipment operation, the Self-Study pattern proved that this kind of perceptual-motor skill can be learned through the avenue of specially-prepared materials without the presence of the instructor.

> In terms of attitudes towards the use of audio-visual materials and equipment in teaching, it appears that the environment and motivation of self-instruction had a greater influence upon the students in the Self-Study pattern than the other patterns. This positive attitude... persisted (at a statistically significant level into the teaching phase)...of the study.
>
> By and large, the interviewers (in the follow-up) were not satisfied that the graduates from the experiment were exploring and utilizing the full potentials of the wide range of audio-visual materials and equipment available.
>
> The evidence from this experiment seems to suggest that the process of self-discovery and personal involvement in determining the merits of audio-visual materials in teaching and learning may develop the attitudes which will result in greater utilization on the teaching job.[21]

In addition to the studies of Oliver and Torkelson which measured the effects of deliberate training in the use of media upon teaching practice, there were various other studies which explored the use of specific types of media in influencing behaviors of pre-service teachers.

A two-phase project by Patrick, including pre-student teaching preparation and a follow-up evaluation during student teaching, showed that viewing filmed examples or experienced teachers in actual classrooms at the secondary school level did improve the performance of student teaching and that this performance level persisted into the first year of teaching when compared with that of non-film groups.[22]

A study at San Jose State College using closed circuit television for viewing classroom activities remote from the campus, together with reduced live observation, proved as effective as the "total established amount of in-person observation."[23]

At Hunter College a two-phase study was conducted with student teachers in a course on elementary school curriculum and methods. In Phase II, relative effectiveness of the following three patterns for supervising student teaching was measured: (a) in-person observation, (b) observation via "live" television, and (c) observation via specially prepared kinescopes. "Statistical differences were demonstrated in favor of both recorded and 'live' television observations over in-person observations, and of recorded television films over 'live' television observation."[24]

During 1960, Tintera in Michigan studied the effectiveness of "three student teaching critique methods: (1) supervisor observation and conference, (2) supervisor observation supplemented by three voice tape recordings which were used in conference, and (3) supervisor observation with three kinescopes of student teacher performance used in conference.... After six months of professional training, the teachers trained with the aid of kinescope (video tape recordings) and voice tape recordings showed no significant differences between themselves; both, however, were significantly higher than the control groups (traditional supervisor method) on the test instruments."[25]

An interesting sidelight to Tintera's study was that the teachers in the experimental groups were subsequently hired at slightly higher average salaries than those in the control groups. The reasons for this seemed directly related to the improvements in poise, voice, mannerisms, and dress attributed to the self-analysis available through the voice and kinescope recordings.

Beberman, at the University of Illinois in 1960, compared the results of four weeks of live observation by teachers of a demonstration class in beginning Algebra with results from thirty-four teachers who viewed twenty edited film recordings made of a normally scheduled algebra class at the University of Illinois High School, 1959-60. Comparisons were made of teacher expectations of teaching difficulties, and their successes, and pupil performance during the ensuing academic year. It was concluded that "(1) film observations provide a more realistic basis for teacher expectations than live class observation, (2) film-trained teachers are more uniform in their attitudes toward (certain topics in algebra) than control groups, and (3) that films are most efficient when they depict general features of the teaching procedure and that they tend to make specific topics appear deceptively easy."[26]

Fulton and Rupiper in Oklahoma found results essentially in the same direction as investigators in previously mentioned studies, namely, that vicarious observational experiences (in this case, filmed sequences and slides) "demonstrated a significantly greater understanding of concepts (in a course on the School in American Culture) than did...direct observational experiences."[27]

As a final study, reference should be made to the work of Kersh in Oregon in measuring the relative effectiveness of various modes for simulating classroom situations through rear-screen filmed presentations. The four variables were life-size simulation in motion; life-size simulation, still; small size simulation in motion; small size simulation, still.

Small size projections in motion were most effective. Kersh concludes: "Perhaps it makes little difference during actual instruction whether the stimulus materials are more or less 'realistic' just so they provide (the teacher) with the opportunity to analyze and to enact responses repeatedly under supervision."[28]

In these studies, it is generally borne out that the use of media which made teaching practices more realistic than verbal descriptions or even live observations, in some instances, had positive effects upon student perceptions of and performance in teaching. There are some isolated results from these and other studies not reported which indicate that some of the positive influences of realistic learning situations carry over into teaching practice. Whether these persist over a long span of time cannot be answered, except only with the tentative generalization that teachers who have had experiences with audiovisual materials and equipment in pre-service preparation use more media than those without training and that the better teachers tend to use media whether they have had formal training or not.

These generalizations, however, contradict some findings. For example, assuming it to be true that teachers benefit by pre-service preparation in the use of media and that better teachers use media regardless of preparation, why do we find such conclusions as that of Godfrey, which said that even though media were available, the teachers in her survey did not plan to use media extensively? Is it a matter of attitude or some other condition?

This same lack of use was evident in Torkelson's study. Among the 235 teachers visited who had been in the experiment and who had acquired formal knowledge about media at significant levels during the preparation period, less than 10 percent were using projected media during the visits of the interviewers. This, of course, could have been the result of a chance situation. However, we cannot help but wonder why 63 percent of the teachers used only the traditional chalkboards, bulletin boards, charts, and maps during all observations. The only promising evidence from the study was that self-instruction was the only pattern which resulted in a positive attitude toward media at any significant level in actual teaching and the one pattern which resulted in greater use of media in the classroom.

From Godfrey's study, it appears that the greatest users of media were the intermediate grade teachers and science teachers. The least use was in mathematics.

Knowlton found subject matter an important determinant in using films. He said, "...the subject taught turned out to be a better predictor of frequency of usage than was attitude....(Also) the favorable attitude teacher who was an infrequent user simply faced greater utilization barriers than were faced by the favorable attitude group whose membership was comprised of frequent users."[29] The greatest use of film in this study was in general science; the least, in mathematics.

Most of us intuitively, by direct observation, or by experimentation perhaps have had occasions to conclude as Godfrey and Knowlton did. In any case, since the evidence on this point is rather meagre, it is obviously important to encourage more research that seeks reasons for meagre use of a wide variety of media.

It is equally important to focus upon pre-service teacher preparation in this area. How, then, should a pre-service program in media usage be designed which will assure greater and more persistent use of media on the teaching job than appears possible under present approaches?

Perhaps the answer to this question is in three parts. One may be suggested by a brief review of what seems to be known about the learning and teaching processes.

A second answer may come from a specification of the teacher competencies in the use of media which can be tied to teacher behavior, particularly if these may be used as a guide to teacher preparation.

The third part of the answer is based upon the suggestions from parts one and two and upon the results of experimentation reviewed earlier in this paper. It is in this section that a new approach will be offered for preparing teachers to become competent in the use of media.

This latter plan is necessarily based upon certain assumptions abut the value of aural and visual media in the teaching-learning process.

One assumption is that some of the solutions to problems in education will come from a careful analysis of what is expected of learners and teachers. This also assumes that a certain body of knowledge about techer and learner behavior does exist which may be of use ultimately in shaping teacher education programs.

The second assumption is that media contribute directly to the improvement of the teaching-learning condition. There is evidence to support this view.

Accepting these assumptions, we then see that the problem becomes the application of knowledge about media and learning to the preparation of teachers to use media.

II. The Learning and Teaching Processes

1. Learner Behavior. Models of how humans learn have been described in various ways depending upon the particular orientation of the learning theorist. One paradigm which appears to be particularly relevant to media use and which has stood the test of time is the stimulus-response conception of behavior. As Kendler has said in the special issue of *Audio-Visual Communication Review*, "Learning Theory and AV Utilization"

> "Stimulus-response language directs our attention to the important variables of learning. On the theoretical level it simply denotes that for learning to occur, a response must be *connected* to a stimulus. This simple formula, when translated into the methodology of conditioning, means that the organism must make the correct response when the appropriate stimulus occurs *and* when the necessary conditions for associative learning are available. These conditions are easily arranged for in the conditioning laboratory where the experimenter can control the occurrence of all three essential factors: the stimulus, response, and the reinforcement.
>
> "These essential conditions are much more difficult to manipulate in a typical audiovisual educational situation, such as through use of training films. Usually there is no great problem in providing the appropriate stimulus, for audiovisual techniques have tremendous advantages over other educational procedures in their ability to present to the learner the stimuli in the most effective manner possible... (what is) sometimes overlooked in the audiovisual program is

> that the stimuli it uses should resemble as closely as possible those that will prevail "on the job." Too often its stimulus situations are those that the learner never meets again. The major problem for the audiovisual educator, however, is to develop techniques by which the appropriate responses to the presented stimuli can be practiced and reinforced. There is no simple recipe for solving this difficult problem. Some suggestions, however, can be made. The educator must know exactly what response he desires to learn....
>
> "Once the characteristics of the to-be-learned response are specified, the task becomes one of getting the student to make it, explicitly or implicitly, in the presence of the appropriate stimulus. Certain points must constantly be kept in mind. First, as stated previously, the response must in some way, partially or completely, be practiced....Second, to complete the learning sequence, the student must be reinforced for making the correct response to the appropriate stimulus....(If) the sequence is successful in presenting the appropriate stimulus and instigating the correct response, learning will more than likely take place.
>
> "It is not the intent of the author to imply that the development of an effective audiovisual training program is a simple mechanical task of arranging suitable stimulus, response, and associative (reinforcing) conditions for learning to occur...the fundamental point is simply that the model of behavior involving stimulus, response, and associative processes has been a powerful tool in ordering the experimental data of learning and related phenomena. The belief expressed here is that if it is used with care and understanding, it will serve as an effective guide for the planning of audiovisual training programs."[30]

Extrapolating Kendler's remarks, we can say that for a response to occur, a learner's response must be connected to a stimulus. Consequently, when we categorize media as perceptual stimuli or stimulus agents, we are led directly to the need for the teacher to understand the role of media in this process and the importance of media in establishing an appropriate "learning condition," as labeled by Travers.[31]

This position of media as perceptual stimuli in the S-R paradigm also suggests that perhaps learners will have greater opportunities for learning if there is ample opportunity for response to a variety of perceptual stimuli in the classroom. Kendler's remarks also imply some things about teacher behavior.

Perhaps the teacher's greatest contribution to the learning process would be to provide a learning environment replete with perceptual stimuli and to tailor teaching techniques to provide for optimum opportunities for student response. This also suggests that the teacher needs ample experience in learning to learn through media so that the learner may be assisted in the same process.

Carpenter has also used the paradigm of the S-R theory to relate learning to the use of media. He, however, identifies an intermediate element between the S-R relationship with an interposition of an O for organism or person. As Carpenter says

> "These symbols are the abc's of learning theories, but like the alphabet when elaborated, they can be changed, analyzed, combined into a language about learning which *is* theory. The resulting language can be interpreted and widely applied, for example, to processes of media communications and to teaching.... In terms of the simple paradigm it can be seen that the "new" media functions most directly and predominately in the S component as the stimulus situation component of the S-O-R formula. It can be observed, also, that the same is true for books, journals, and other forms of printed material. Many of the activities of teachers fall into the same category. They, too, are part of the stimulus situation for students.
>
> "From this position, granting that any carrier of information operates within knowable limits and imprints some of its characteristics on the message, two deductions can be made: First, the content--the inherent or arranged structure

> of the stimulus materials--as well as the degrees to which these materials relate synchronously to the active learning-motivation potentials of the learner, constitute a cluster of determinants of more importance than the medium. There are extensive research results to support this deduction. Second, given the media and effectively organized learning materials, another cluster of important determiners of learning is the way in which stimulus materials are used within the total system of instruction, in their interaction with the learner, and in the instigation of motivated learning responses."[32]

Carpenter's position goes beyond that of Kendler by suggesting a need to consider the use of stimulus materials "within the total system of instruction." This implies that teacher preparation in the use of media must be broader in scope than the confines of the classroom. In fact, Carpenter's remarks underline the trend towards the "systems" approach to instruction, with the resulting need to take a fresh look at media and the teacher as each may contribute maximally to the process of instruction and learning.

If we accept the judgments of Kendler and Carpenter, it becomes obvious that teacher preparation should include experience in the use of media for establishing optimum learning conditions to evoke proper learning responses. It is not the purpose of this paper, however, to suggest what might be proper learner responses. These will come hopefully from the curriculum of the school and the demands of society.

Travers summarizes the essentials of the human "learning condition" as follows:

> "The design of human learning conditions is generally considered to be a two-stage operation. First the goals of learning must be specified, and second, procedures, materials, and equipment related to the achievement of those goals must

> be specified. With respect to the first of these two stages, psychologists have already played an important role by providing means through which the goals of learning can be accurately specified.*
>
> "...Such goals must be defined in terms of behavior manifested by those in whom the goal has been achieved if they are to serve as a basis for the planning of learning.
>
> "...The systematic design of learning conditions involves the planning of the child's environment in such a way that the impact of stimuli has the maximum effect in promoting learning in the directions that are specified by the objectives.
>
> "...The main events which exert control over the learning of the pupils are the behaviors of the teacher, and the main objects which exert such control are the pieces of educational equipment provided....Almost nothing is known about the way in which educational equipment should furnish cues to the learner, and even less about the conditions which make for effective use of models and other analogies. Much more knowledge is also needed about conditions in the classroom which raise the level of arousal to the level required for effective learning."[33]

2. Teacher Performance. One important aspect of the "learning condition" is the teacher's behavior in determining learning objectives and in setting the learning condition.

Describing teacher behavior is a complex matter, for there are a number of general determinants of teacher behavior which complicate any description. In the *Handbook of Research on Teaching*, Wallen and Travers identify six such patterns:

---

*Robert F. Mager, *Preparing Objectives for Programmed Instruction*. San Francisco: Fearon Publishers, 1961). (See this publication as one plan for preparing objectives.) [Travers' note.]

a. patterns derived from teaching traditions: e.g., a teacher teaches as he was taught;

b. patterns derived from social learnings in the teacher's background: e.g., a teacher reinforces the behavior of pupils so as to develop a middle-class ideology;

c. patterns derived from philosophical traditions: e.g., Froebel or Rousseau tradition;

d. patterns generated by a teacher's own needs: e.g., a teacher adopts a lecture method because he needs to be self-assertive;

e. patterns generated by conditions existing in the school and community: e.g., formal and highly disciplined because this is required by the principal; and

f. patterns derived from scientific research on learning.[34]

In terms of preparing teachers to use media effectively as perceptual stimuli, whether in their own presentations or in preparing self-study situations for learners, these six determinants of teacher behavior each have something to suggest. A few examples may suffice.

If it is true that a teacher teaches as he is taught, then we might expect that immersing teacher trainees in a professional program saturated with media experiences would insure use in teaching. This assumes wide experiences in media use during professional preparation, not only on a personal basis, but also by observing professors who use media in their own teaching.

If the teacher's personality and makeup require self-assertiveness, then perhaps it may be unpalatable to become part of a "system" of teaching in which some of the media may supplement and, in fact, supplant some of the teacher's assumed functions. Perhaps there is an important relationship between the teacher's inherent needs and the willingness or drive to use media in the classroom.

If the "subculture" of the school system is dominated by an anti-media principal or supervisor or by the more prestigious teachers in the system, then what difficulties does the new pro-media teacher face, and what does this suggest for teacher preparation?

According to another author, it appears that the more traditional teacher patterns of behavior are changing. As described by Dean M. Laux, Senior Science Editor for Science Research Associates,

> "Basically, the teacher is learning to function differently in order to promote a different type of learning. Emphasis is shifting away from the mastery of old knowledge to techniques for developing access to new knowledge. In the process of developing access, of course, existing knowledge is still important and cannot be discarded; it is simply reorganized.
>
> "...The teacher under these circumstances, acts less as an authority figure than is the custom in an autocratic classroom. The teacher, like his students, cannot be expected to be knowledgeable about all phases of the broad and expanding disciplines of the sciences, social sciences, and mathematics. He thus functions in directing student inquiry and in creating an environment wherein learning is maximized.
>
> "...The very nature of his work--organizing methods of inquiry--requires that the teacher make basic curriculum decisions and to initiate changes without recourse to a book of instructions.

> "...In addition to his function as a resource, the teacher is increasingly acting as a coordinator as well. That is, by properly coordinating or programming the use of other resources, he is creating an environment for learning."[35]

The creation of an environment for learning has broad implications for the use of media, particularly when we consider the potentialities of media for generating learner interest and for adding vicarious "substance" to his "environment." How the teacher should operate in this environment is not completely clear. However, there are some directions which may be inferred from what is known about principles of learning.

Implications for teaching methods and certainly for teacher training are inherent in certain selected principles of learning discussed by Wallen and Travers in the Handbook of Research on Teaching.[36] These principles are included here, without extensive elaboration, as a basis for inferring teacher behavior and for suggesting teacher competency in media use where media applications seem implicit.

> "Principle 1: Behavior which represents the achievement or partial achievement of an educational objective should be reinforced:

> "Principle 2: The introduction of cues which arouse motivation toward the achievement of an educational objective will increase the effectiveness with which that objective is achieved.

It is as stimuli for arousing responses that media are apt to have significant contributions to make.

> " Principle 3: Practice in supplying a principle to the solution of problems will increase the probability of transfer of training to new problems which require the use of the same principle for their solution.

This suggests, for teacher training, actual experience in discovering and applying principles of learning applicable to given kinds of learning. According to this principle, pre-service teachers would perhaps demonstrate greater skill in using media to solve certain types of problems if they were required to discover some of the principles associated with the use of media through the actual discovery process. This principle is particularly pertinent to the plan offered in the final section of this paper.

> "Principle 4: Since learners differ in their capacity to make the responses to be acquired, learning will be most efficient if it is planned so that each learner embarks on a program commensurate with his capacity to acquire new responses."

The obvious application here for media and for teacher training appears to be in the realm of self-instruction, of programming, and of providing the "learning condition" rich in opportunities to respond to various media.

> "Principle 5: If a pupil has had training in imitation, then he is capable of learning by observing demonstrations of the skills to be acquired."

This principle has supporting evidence from research reported earlier which proved the effectiveness of using film and television not only as an avenue for observing experienced teachers but also as a critique of student teacher performance as well. Substituting the word teacher for pupil in the principle suggests the value of this technique in teacher preparation.

> "Principle 6: The learner will learn more efficiently if he makes the responses to be learned than if he learns by observing another make the response or make some related response."

This principle suggests the great need for teacher trainees to take an active role in the learning process and in the discovery of principles of learning relative to the use of media.

Implicit in the above may be the thought that if we have theories of learning we may not need theories of teaching because teaching simply implies that the teacher act upon the theories of learning. According to Gage's analysis of theories of teaching,[37] this is perhaps one reason for an almost complete lack of such theories. Gage contends that theories of teaching are needed and potentially useful in defining the teaching process.

What may we learn about media applications, for example, if we could interpret teacher acceptance and use of media through Gage's classes of theories about teaching: one which undertakes to explain why teachers behave as they do; and the other which attempts to explain how it is that the behavior of a teacher can influence the behavior of a student? Once we get insights into these problems, it would appear that the determination of proper teacher preparation in the use of media would become much more simplified.

III. Teaching Models

This finally brings us to the problem of identifying teacher competencies, assuming they can be specified, and to a plan for teacher preparation.

Since the ultimate objective of this discussion is to relate specific teacher competencies to teacher training programs, there may be some merit and economy of space resulting from the establishment of common competencies that all teachers should have regardless of the peculiarities of given learning conditions. To paraphrase Gage in the previously cited discussion of theories of teaching, "A general conception of teaching (media use, in this context) should apply to any grade level, any subject matter, and any situation, whether in school or out." This point of view seems especially significant in another sense. The preparation of teachers--or of anyone else, for that matter--to communicate through the use of media is essentially a common process of (a) conceptualizing the aspects of the communication process in which media will play a part; (b) identifying the qualities of media as they affect the communication process and the interactions of these qualities with learning objectives and learner characteristics; (c) selecting and shaping the form and mode of the media which are to be used; (d) providing optimum conditions for learners to attend to the media; and (e) providing opportunities for learner feedback which, in turn, will modify further use.

Any attempt to identify distinct levels of teacher competency related peculiarly to a given condition may result in an artificial categorization of teacher competency. It would appear more useful, therefore, to delineate common competencies. Perhaps the four areas summarized by Fulton and White will represent a consensus of the field. An attempt will be made to specify in behavioral terms some representative competencies under each category. It should be understood that these suggestions are not to be regarded as exhaustive. They are but examples to which more items may be added and under which sub-categories may be subsumed. It is also assumed that the behavioral objectives listed are closely tied to the ultimate requirements of teaching.

Selection and Evaluation of Materials

a. To specify the learning task in behavioral terms for which a medium is to be used.

b. To be able to theorize, at least,--when facts are unavailable--about the uniqueness of a given medium for a given task and learner.

c. To make a choice among the qualities of a medium, e.g., details, arrangement, color versus black and white, and so forth, as these qualities will contribute to the optimum design and application of the medium in relation to the outcomes specified.

d. To formulate an intellectual structure which explains media in the perspective of the teaching-learning process.

e. To create evaluative devices and techniques for measuring quantitative and qualitative feedback from the learner for purposes of analyzing effects of media for given learners and objectives.

f. To use sources for media (with discrimination).

g. To select media on the basis of defensible criteria.

h. To know the anatomy and "language" of media so their potentialities and limitations may be accounted for in use.

Utilization of Appropriate Instructional Materials

a. To design and arrange the learning space to support the use of media.

b. To incorporate media skillfully in the "flow" of a lesson.

c. To guide learners in the selection and utilization of media for their own purposes.

d. To demonstrate methodology in use of media consistent with requirements of learning objectives and learner characteristics, e.g., how to introduce and follow up the use of a film designed to shape attitudes.

e. To overcome media limitations through appropriate methodology and editing or restructuring of the medium itself.

d. To adapt techniques in the use of media to varying sizes of learner groups.

e. To use media in complementary combinations.

Production of Simple Instructional Materials

a. To demonstrate acceptable processes in constructing bulletin boards, charts, graphs, feltboards, exhibits, transparencies of various types.

b. To adopt and create media of various kinds for self-instructional uses on the basis of specified objectives and learner characteristics.

c. To guide learners in the creation of materials of various kinds as avenues for their own expression.

d. To outline and write sequences for producing slide and filmed sequences.

Preparation and Use of Physical Facilities

a. To demonstrate by performance a knowledge of projection principles.

b. To operate standard kinds of projection and recording
   equipment at determined criterion levels.

c. To prepare a learning space under varying conditions for
   optimum use of projected materials.

d. To demonstrate simple maintenance techniques, such as
   replacing projection lamps.

e. To demonstrate proper handling of various types of materials.

To these categories, I would add other desirable attributes. One may be described as an effective or attitudinal "set" relative to media. That is, the teacher should reflect a positiveness in her thinking and behavior which is characterized by a professional open-mindedness and inquisitiveness about media. This is not suggesting a categorical, unquestioned acceptance, but a willingness to approach the use of media in teaching from a scientific point of view.

Another attribute the teacher should exhibit is an interest and competence as a consumer of research findings about media which may give her insights for further validation or refutation of classroom practices.

Finally, it is desired that she be experimentally oriented to the extent that she may exhibit confidence and skill in trying out and testing variations in the use of media.

1. Application to Categories of Learning Conditions. As an attempt to summarize teacher behavior and use of media under given conditions, five categories of teaching are used. These have been suggested as part of the format for this volume. They attempt to separate teaching conditions

on a continuum, proceeding from a teacher-dominated situation in Category I to a completely student-dominated situation at the other terminus of the continuum, Category V.

a. Category I. In Category I, the teacher is described as the sole source of content, making all decisions relating to instruction.

I would interpret this description as requiring the teacher to have competencies in the use of media related primarily to the descriptive, expository processes. The teacher should be capable of adjusting media to the purposes of this context.

The operation of related equipment is subsumed under this category and in all categories, for that matter.

b. Category II. In this category, the essential difference from Category I appears to be the occasional addition of outside sources of information, with the teacher still in domination. In essence this appears to require the same competencies of the teacher-dominated situation with the additional requirement of skill in fitting outside sources into the flow of the teacher-dominated lesson.

c. Category III. In this condition, most of the resources are prepackaged but with adaptation by the teacher to meet community and individual needs. I am assuming this to mean a beginning of student participation and student decision in choosing among activities.

If this be the case, the teacher's competencies in the use of media would extend to helping the learner to gain insights from the media by himself, to a degree. This category may also imply a greater interchange between the learner and media. This would mean that the teacher would need to develop in the learner an inquiring, questioning, interpretive approach to media. In some cases, the teacher may provide opportunities for some individual instruction through media.

d. Category IV. In Category IV, emphasis is upon individual learner activity with the teacher and the media becoming more supportive of the learning process than under a teacher-dominated situation. It could be assumed that under this arrangement the teacher may spend a considerable amount of time preparing content in various forms, particularly in programed form, and perhaps for television or filmed-loop presentations. Occasionally, the teacher may carry on a dialogue with one pupil, a small group, or a large group. Sometimes, the teacher may become part of a team, contributing in a primary role on one occasion and a subsidiary role on another. In terms of media competency, this kind of arrangement would appear to require the greatest ability of the teacher to orchestrate the learning condition, making optimum use of training in the use of media.

e. Category V. The final category presumes a condition in which the learner appears to be the sole arbiter of his destiny, with the teacher completely to one side. In this situation the teacher would need to be particularly skilled in setting a learning condition in which the attending of the learner to the condition would be dependent upon the skill of the teacher in creating a stimulating, self-contained environment. It would appear that in this situation the teacher would act mostly as a "mediated teacher" in the learning task, available to the learner via video tape, filmed loops, audio tapes, slides, and so forth, the decision to use these "canned" materials being solely at the discretion of the learner.

In this situation, the teacher may become the organizer of knowledge, the researcher to keep information current, the counselor, advisor, tutor, when the student demanded.

In addition to the great variety of competencies required for this area, the teacher would need the type of personality which would allow ego submergence and dominance by a system.

2. A Plan for Developing Competencies. Finally, we have arrived at an attempt to describe a Utopian teacher preparation program. This is an audacious undertaking, as has been alluded to earlier. This does not mean, however, that timidity and clichés about impossibilities and imponderables should be the conclusion of this discussion. Rather, there may be hope for teacher preparation in the use of media if we heed the lessons from the fields of learning, from media research, from our long experience in teacher education, and from the broad battlefront of the classroom. Admittedly, what will be suggested may appear to be logistically unworkable and impossible, at least in the traditional climate of teacher preparation. On the other hand, it may prove to be workable and feasible. At least, there appears to be some support for it in the literature.

What I am suggesting as a first departure is that teacher preparation institutions begin regarding pre-service teachers as learners who are subject to the same needs and laws of learning as the learners in the many public classrooms. Once we recognize in teacher preparation that we are dealing with learners, we can take advantage of the situation by learning to learn about and teaching processes with the learners who are to be teachers. In a learning laboratory, as I would name it, let's take advantage of the potentials of the discovery process in learning. Instead of telling teachers how to teach, let's demonstrate how to teach by the application of principles of learning to our own procedures and curriculums, and let's get students involved in analyzing the procedures we use. Media and media techniques should be used not only in teaching about media but in all areas of instruction. In addition, the curriculum of teacher education should be examined for purposes of identifying common elements in various areas of teacher preparation so that vertical and horizontal integration and experience may occur. Longitudinal studies should be undertaken to test various patterns of pre-teacher involvement. Behavioral objectives should be spelled out, even if arbitrarily, to begin to get objective measures of student performance. These and many other related problems of logistics, block timing, utilization of faculty, development of physical facilities, and overcoming of institutional inertia need to be considered. To suggest how we might apply this pattern in a small way to the development of competencies in the use of media, I propose the following as an example.

Universally, teachers are required to develop some skills in the operation of equipment and in making simple kinds of learning resources. The traditional pattern has been instructor-dominated instruction, with a growing emphasis upon self-instructional techniques. In terms of results, this approach has prepared teachers to perform the prescribed tasks. As a learning experience to provide insights into the processes involved in learning a skill, these experiences, as traditionally handled, do little or nothing. I would suggest the following technique for adding another dimension to the pattern, one which may have real potential for transfer to a "live" classroom situation and one which may serve as an exemplar for other aspects of teacher preparation in the use of media.

Assume that the relatively simple task of learning to operate a piece of audiovisual equipment at a given criterion level was specified as the objective. Under the learning laboratory approach, I as a teacher would first of all make it clear to the learners that I was not going to teach them to operate the piece of equipment. This responsibility would be theirs, singly or collectively, depending upon the numbers who had to be taught and the demands on the equipment.

I would specify that they must learn to operate the equipment without assistance, to explain its "workings," and to operate it within a specified time limit and at a given criterion level of performance. I would demand not only skill in operation but also an anecdotal record of approaches used in mastering the task. To provide direction for this phase, I would make the reporting procedures explicit and consistent with the outcomes intended.

In addition to the performance task and the anecdotal account, I would require that the pre-service teachers produce materials which would assist an uninitiated person or group of persons to learn the identical task after they had completed their project.

After the criterion levels had been met, as specified, I would require as a further step that the project group search the literature on teaching a skill to test the "goodness of fit" of their procedures with the experts.

Upon completion of the analytical stage, the group would then be ready to meet with the professors not only in media but also in educational psychology, teaching methods, and evaluation and to attempt some generalizations.

As a final step, the group would then be required to design the learning conditions for teaching another specific skill to a specific age and type of learner from the public schools. Once ready, the group would evaluate their results by actually teaching the skill to the learner specified and measuring the learner's performance.

As a variation to this approach, I as the instructor would take a second group of pre-service teachers, assign the same task, and require the same procedures, except that the project materials developed by the first group would become the basis for skill acquisition by the second. The added specification for the second group would be, in addition to an anecdotal record, that the project would not be accepted as complete until the "package" for teaching the skill had been improved. Ultimately, we thus arrive at a kind of "package" which not only exemplified the application and "discovery" of learning principles but had become a teaching package with a high "predictability-for-success" factor built in.

This approach could be extended to other types of learning and would require careful planning. It would require a commitment to continuous experimentation. It would require changes in the structuring and sequencing of professional information, perhaps even to the elimination of some of the traditional courses as now devised. It would require a close integration of activities between the public schools and colleges. It would mandate the full complement of technological aids to instruction in order to arrive at optimum conditions for controlling experimentation and for varying learning conditions.

Placing instruction in media use in this sort of a context would require something quite different from traditional approaches now in use. The new approach would perhaps most closely approximate a self-instruction context, with "systems-of-instruction" overtones. The media specialist and the pre-service teacher would work together in an ongoing learning laboratory where the major concentration in the media component would be upon learning problems, using analytical, experimental, problem-solving approaches. All professors and school personnel concerned with related aspects would be members of a team. Except for self-instructional laboratories, where basic "how-to-do-it," operational skills would be planned on a non-credit basis, it may be that the separate audiovisual course would disappear and the ultimate in integration result. In this context alone, consider the rich possibilities for influencing all pro-ressionals in teacher preparation to use media!

The scheme, as proposed, is Utopian and will undoubtedly be met with all types of inertia and resistance. On the other hand, it contains some promises for influencing transfer of understandings, skills, and attitudes in the media area to the classrooms.

This would be a bold step in teacher preparation. If it cannot be realized at first in the total curriculum, at least those in the media field should begin to experiment with such approaches in their own classes. The teacher competencies in the use of media that might be developed in this context would in no way conflict with present prescriptions of what these competencies might be. My judgment is that the desired competencies would be considerably enhanced by this approach and that we would be on our way toward gathering verifiable evidence of what teacher competencies in media and programs for their realization should be.

FOOTNOTES

1. *Techniques of Visual-Sensory Aids*, Department of Public Instruction Bulletin, No. 509 (Harrisburg, Pennsylvania, 1939), p. 3.

2. Elizabeth G. Noel and J. Paul Leonard, *Foundations for Teacher Education in Audio-Visual Instruction* (Washington, D. C.: American Council on Education, 1947).

3. Results were summarized in The Pascoe Report, *Audio-Visual Instruction*, Vol. 4, No. 1, (1959), Pp. 607.

4. William Allen (ed.), *A Summary of the Lake Okoboji Audio-Visual Leadership Conferences Held at the Iowa Lakeside Laboratory*, Milford, Iowa during the Years, 1955-1959 (Washington, D. C.: Department of Audio-Visual Instruction, National Education Association, 1960), p. 27.

5. *Ibid*., p. 28

6. *Ibid*., p. 88.

7. Herbert Hite, "A Study of Teacher Education Methods for Audio-Visual Competency in Washington--1937--1947," unpublished dissertation (Washington State University, 1951).

8. Anna L. Hyer, "A Study of Possible Deterrents to Use of Motion Pictures within a School System Where Films and Facilities for Use Were Provided," unpublished dissertation (Indiana University, 1952).

9. Paul H. Imbrock, "Pre-Service Education of Teachers in the Use of Audio-Visual Materials of Instruction," unpublished dissertation (Teachers College, Columbia University, 1950).

10. Holland O. Meiser, "An Exploration of Factors Affecting the Utilization of Audio-Visual Materials," unpublished dissertation (Indiana University, 1952).

11. Frederick A White, "Teacher Competence in the Uses of Audio-Visual Materials," *Audio-Visual Communication Review*, I (1953), 91-98.

12. Harold W. Benda, "A Plan for the Improvement of the Pre-Service Course in Audio-Visual Education for the State Teachers Colleges of New Jersey," University Abstracts, University Microfilms, Ann Arbor, Michigan. Vol. 18, No. 5, pp. 17-27.

13. Maurice B. Camp, "Some Factors Relating to the Utilization of Audio-Visual Materials, with Suggestions for Teacher Preparation in This Area," unpublished dissertation (The Pennsylvania State University, 1957).

14. Paul C. Read, "A Study of the Use Made of a Group of Sound Motion Pictures in Relation to the Administration of the Department of Visual and Radio Education, Rochester Public Schools," unpublished thesis (Syracuse University, 1950).

15. R. W. Harris, "Uses of Audio-Visual Materials in Adult Education," *Audio-Visual Guide*, XIX (1953), pp. 5-6.

16. *The Status of the American Public School Teacher,* National Association Research Bulletin, Vol. XXXV, No. 1 (Washington, D. C., 1957), pp. 30 and 57.

17. *Audio-Visual Education in Urban School Districts, 1953-54*, National Education Association Research Bulletin, Vol. XXXIII, No. 3 (Washington, D. C., 1955), p. 111.

18. G. E. Oliver, *A Study of Pre-Service Teacher Education in the Use of Media of Mass Communication for Classroom Instruction*, National Defense Education Act, Title VII, Project No. 130 (College of Education, University of Georgia, September, 1962), pp. 68-70.

19. Eleanor P. Godfrey, *Audio-Visual Programs in the Public School*, Office of Education Contract No. SAE-9026, preliminary results (Bureau of Social Science Research, Inc., Washington, D. C., May 6, 1963), p. 20.

20. Paul Bixby and Harold Mitzel, editors, *The Campus School--A Research and Dissemination Center*, National Defense Education Act, Title VII, Part B, (The Pennsylvania State University, 1965), p. 83.

21. Gerald M. Torkelson, *An Experimental Study of Patterns for Improving the Preparation of Pre-Service Teachers in the Use of Audio-Visual Materials and of Effects on Pupils*, National Defense Education Act, Title VII, Project No. 079 (The Pennsylvania State University, March, 1965), pp. 148-152.

22. Robert B. Patrick, *The Measurement of the Effectiveness of the Documentary Sound-Film as a Supplement in the Teaching of Methods to College Students Being Prepared to Teach in the Secondary Schools*, National Defense Education Act, Title VII, Project No. 217 (The Pennsylvania State University); Robert B. Patrick and Hugh M. Davison, *The Effectiveness of the Documentary Sound-Film as a Supplement in Secondary School Teacher Education--A Follow-Up of First Year Teacher Performance*, National Defense Education Act, Title VII, Project No. 868 (The Pennsylvania State University, September, 1963).

23. William R. Rogers, *Television Utilization in the Observation Program for Teacher Education*, National Defense Education Act, Title VII, Grant No. 704001, (San Jose State College, 1962), p. 35.

24. Herbert Schueler, Milton J. Gold, and Harold E. Mitzel, The Use of Television for Improving Teacher Training and for Improving Measures of Student-Teaching Performance, Phase I, National Defense Education Act, Title Vii, Grant No. 730035, (Hunter College of the City University of New York, 1962); Nathan Stoller and Gerald S. Lesser, The Use of Television for Improving Teacher Training and for Improving Measure of Student-Teaching Performance, Phase II, National Defense Education Act, Title VII, Grant No. 730035, (Hunter College of the City University of New York, 1963), p. iii.

25. James B. Tintera, Student Teaching, National Defense Education Act, Title VII, Project No. 008E (Wayne State University, pp. 1, 34.

26. Max Beberman, A Study To Determine the Relative Effectiveness of the Use of a Series of Filmed Demonstrations in Teacher Education for a New High School Mathematics Curriculum, National Defense Education Act, Title VII, Project No. 158 (Committee on School Mathematics, University of Illinois, p. 55.

27. William R. Fulton and Omer J. Rupiper, Selected Vicarious Experiences Versus Direct Observational Experiences of Pre-Service Teachers in the Foundation Areas of Professional Preparation at the University of Oklahoma, National Defense Education Act, Title VII, Grant No. 734031.00.10.21 (Research Institute, University of Oklahoma), p. 51.

28. Bert Y. Kersh, Classroom Simulation: A New Dimension in Teacher Education, National Defense Education Act, Title VII, Project No. 886 (Oregon State System of Higher Education, June 30, 1963), p. 52.

29. James Q. Knowlton, Studies of Patterns of Influence in the School Situation as They Affect the Use of Audiovisual Materials, National Defense Education Act, Title VII, Grant No. 7-12-029.00 (Division of Education Media and Audio-Visual Center, Indiana University, July, 1963), p. 89.

30. Howard H. Kendler, "Stimulus-Response Psychology and Audiovisual Education," Audio-Visual Communication Review, Vol. 9, No. 5 (1961), pp. 36-38.

31. Robert M. W. Travers, Essentials of Learning (New York: The Macmillan Company, 1963), p. 508.

32. C. Ray Carpenter, "Boundaries of Learning Theories and Mediators of Learning," working paper from The National Conference on Teacher Education and New Media, University of Michigan, January 8-11, 1961, pp. 7, 17.

33. Travers, pp. 509-510.

34. Norman E. Wallen and Robert M. W. Travers, "Analysis and Investigation of Teaching Methods," in *Handbook of Research on Teaching*, ed. N. L. Gage (Chicago, Illinois: Rand McNally and Company, 1963), pp. 452-453,

35. Dean M. Laux, "A New Role for Teachers?" *Phi Delta Kappan*, XLVI (1965), 267.

36. Wallen and Travers, pp. 494-500.

37. Nate L. Gage, "Paradigms For Research on Teaching," in *Handbook of Research on Teaching*, ed. N. L. Gage (Chicago, Illinois: Rand McNally and Company, 1963), pp. 94-141.

CHAPTER VIII

MEDIA COMPETENCIES FOR TEACHERS

W. C. Meierhenry

The preceding papers have a number of implications for the most effective performance of teachers at all levels. They suggest, first of all, a somewhat different teaching model than has been used traditionally. Second, they suggest a laboratory approach in order to enable the student to reach specified objectives. Third, they suggest that the technology now available and that which will become available demand a new approach to the teaching-learning act. Fourth, the papers suggest that fixed lines between pre-service and in-service and between elementary-secondary and higher education are no longer clear; and, fifth, that although bits and pieces of the new approach are found around the country institutions need to be challenged to consider the implications of the various proposals. There follow below background statements for greater understanding of the competencies subsequently proposed.

I. Rationale

There are three basic points which more or less constitute a rationale or background for the proposals which follow. First is the idea that "everyone is a learner." The implication is that students in the classroom are learners, the teacher who teaches these children is a learner, and the teacher-educator is also a learner. The content which each of these succesive groups of individuals must learn is quite different, but the process of learning is much the same. We have always considered that the pupil was the recipient of our instruction and that he was the learner but that the teacher who teaches him had "arrived." It is now evident that no one has all the requisite knowledge or methods or processes because all are constantly changing and as a result the teacher of teachers must be as much a learner as the neophyte teachers or the elementary and secondary pupils with whom the prospective teachers will eventually work.

The second basic point, which grows out of the first, is that learning is a continuous and lifelong process. There, no doubt, was a time when knowledge was so stable and the means of communicating the content were so static that teachers and professors could rest comfortably after they had achieved the bachelor's, the master's, or the doctor's degree. At the rate at which knowledge is increasing in all fields and particularly in regard to what we are learning about how humans learn, no one who is in education can escape the obligation of spending practically all of his waking hours continuing to learn. Again here, media in all of its modern packaging forms and the new ways of transmission make it possible for the first time for everyone, regardless of where he lives, to have almost immediate access to all the world's knowledge.

The third basic part of the rationale is that we now begin with the learner and ascertain how he needs to behave when he has completed the instructional sequence. A number of recent developments have focused on the learner and his behavior, among them programed instruction, systems developments, and learning theories. It is suggested that we ascertain how the elementary and secondary education student should behave differently when he has undergone instruction, how the teacher education program and how the college faculty member should behave differently as he works with the process of identifying pupil behavior, teacher behavior, and his own new learning activities. Instead of starting with a curriculum and a predetermined plan of teacher education which are presented to students in lecture and/or book form, we must start with what constitutes the teaching act, what behavior exemplifies the successful performance of that act, and then determine the activities in which the neophyte teacher must engage in order to achieve such objectives successfully.

II. Laboratory Approach

Competencies should be identified which teachers must exemplify in all areas of teaching, although this paper is focused on the competencies needed in the utilization of the newer media. It is proposed that teacher education of the future will become much more of a laboratory approach with the media presenting the raw data and stuff out of which the various competencies related to the teaching act are developed and built with the help of a dynamic and ever- earning professional staff. Students pursuing such teacher education programs will be utilizing the same learning resources, in most instances, as they will be using with students: television, 8mm film, transparencies, 16mm film, programed instruction, self-instructional laboratories, etc. Media will be used to serve the function of eliciting proper teaching behavior. It is at that particular time that it is appropriate to learn how to utilize the media properly. A person learning to operate a motion picture projector without any hope of using it in either the professional or the substantive areas of his education is in much the same position as one who learns a foreign language but never goes abroad. As was suggested earlier, the reason for using media for learning is the same whether you are the college professor, the student in teacher education, or the student in the classroom. Media are used, therefore, to facilitate learning, and the time to develop the competency is when a demand is made upon the student to utilize the media for his own learning or as a means of assisting some one else to learn.

III. Competencies

There are three broad competencies which all teachers should have and which can be incorporated into the teacher education program if it is properly designed and focused on what the student must do when he functions as a classroom teacher. First, there obviously is need for theory in teacher education programs. As proposed earlier, theory only becomes real when it is translated into some kind of hard and soft ware so that it can be seen and tested. Such theories as those concerned with learning, structures of knowledge, discovery, inquiry, inductive reasoning, and many other of the newer speculations must be translated into a form which teacher education students can examine and judge the validity of for themselves.

The second competency is what has been called message design, the development of an instructional sequence or an instructional system.

Students must have experiences in preparing story boards and designing relevant teaching bits, testing them out with one or a few children, obtaining the feedback as a result of critical analysis, redoing the sequence, trying it out again, and continuing with further evaluation and feedback. Dr. T. Keith Glennan in a recent article in *Saturday Review* discussed this matter of design.

> "Engineering is a profession primarily concerned with design in the broadest sense of the word. Design begins with the recognition of a need and the conception of an idea or ideas to satisfy this need. It proceeds with the definition of the problem, continues through a program of directed research and development, and concludes by building and bringing into operation something which did not previously exist. The end product may be an improvement on an old machine, process, or system, or it may be the translation of new knowledge into new solutions of old or new problems. The object of design can be very simple--a tool, a chair, a pipe fitting; or it can be very complex--a missile system, an automatically controlled nuclear power plant, an information processing system, or a city."[1]

I am suggesting that the task of the teacher is likewise a design problem. It is in the design function that the neophyte teacher will come to understand the necessity for a wide range of resources in addition to verbal symbols. If he has successfully mastered the operational and production skills in the context of his own learning, he should be able to utilize the newer media successfully in his own teaching.

There are several teacher education programs underway which attempt to break down the teaching act into its various parts. One such approach which appears to hold great promise is the micro-teaching approach at Stanford University. In addition to the work at Stanford, many other universities are recording teachers in the classroom teaching, and at some institutions, such as Wayne State University, there is an attempt to bring into the classroom some aspects of the social and cultural context of teaching. Video tapes have been prepared in which a youngster is seen as he is picked up at his home, the members of his family are shown, the kind of home and family which he has is indicated, the youngster is shown on the way to school so that the neighborhood in which he lives can be observed, and finally he is followed through the school day so that we see him perform in the various subject matter areas and activities of the classroom. Two cameras are used: one shows the broad picture; the other, a close-up--inserted in one corner--of the child being studied. Thus, there are now various ways of achieving an analysis of the teaching act with some understanding of the dynamics which surround the behavior of children before the student preparing to become a teacher finally moves into the classroom where decisions he makes are "for keeps." The use of simulation, for example, as carried out at Monmouth State College in Oregon, appears to be another potentially fruitful approach. Third, certain skills will be required in the production of materials as well as in the operation of equipment. Fairly advanced programs can be found which include the various kinds of laboratories and which make it possible for the student to instruct herself in the production of materials and to develop the necessary skills in the operation of equipment. Such institutions as the University of Connecticut, Syracuse University, Arizona State University, San Jose State College, and Wayne State University at Detroit have these laboratories.

In addition to the necessary skills in the operation of equipment, there is also a variety of production skills which teachers must have in order to prepare pupil-centered and community-related resources. Here, too, laboratories can be arranged which make it possible for students to learn how to prepare slides, transparencies, tape recordings, and graphics as well as other similar types of learning materials. Many of the same institutions, mentioned above, which have laboratories for equipment operation also have laboratories for students and staff to learn the processes of so-called local production.

The breakthrough in understanding of human learning, the process of teaching, and the introduction of new content is possible because of the new technology. The new technology can serve by providing the mediating experience between the student and the content at all levels of teaching. In order for the teacher to operate successfully in the modern classroom, she must have frequent and intimate encounters with media, their design, and their projection. This is a responsibility for teacher education institutions both in the development of a pertinent and functional program of teacher education and in supplying candidates to the classrooms so that the youth of the nation may also have such an educational experience.

IV. A Word of Caution

This newly proposed program for the development of teacher competencies contains certain risks and danger spots. For example, some teacher-educators who have not followed carefully the proposals presented earlier will assume that no special attention needs to be given now to the area of media or media competencies in teacher education. Such persons will feel that the responsibility has now been shifted to methods courses, the internship, and even the academic areas. It is true that the proposals in this report do call for broader sharing of the development of competencies in the use of the new technology. A careful examination of the various recommendations, however, will make it clear that more careful and systematic planning will need to be carried out in regard to the entire teacher education program than was done previously and that the media competencies must now be deliberately planned with purposes and functions to be met rather than developed haphazardly, incidentally, or not at all. All persons responsible for the education of teachers, including those who teach foundation courses, child growth and learning courses, and the methods courses along with the academic areas, must provide for learning experiences involving media in order that the prospective teachers may experience firsthand the contributions of such learning resources. Interestingly enough, there are a number of examples around the country which suggest that some academic areas, such as Postlewait's teaching of botany at Purdue and the teaching of French at Antioch, help students to use and appreciate the contributions of media to the learning process to a greater degree than is found in the whole professional sequence in many teacher education institutions. Thus, the academic areas are beginning to exploit the various approaches suggested in this report and to teach basic content recommendations.

V. Recommendations

Experience with the TEAM Project suggests that it is essential to interpret a report to numerous audiences. It was the unanimous conclusion of those associated with this current project that a variety of follow-up activities should be planned and developed.

1. The widest possible dissemination of this report to teacher education institutions and public schools
2. The holding of a series of conferences which would bring together
   "a. educational media specialists and the academicians from the arts and sciences area to look at and identify the principles, concepts, and knowledges that contribute to an understanding of principles of communication of ideas and information in the classroom,
   b. educational media specialists and teacher educators that look at instructional problems in teacher preparation as they involve media understanding, first in relation to the curriculum and then in relation to methods, and
   c. educational media specialists, teacher educators, and public school personnel concerned with the priority of professional experiences and the

place and function of the public school in the education of teachers."*

3. The support of several institutions of varying sizes representing both public and private institutions which would be willing to undertake a review of their teacher education program and to secure and/or develop the necessary hardware and soft ware to implement the new program of teacher education including the development of media competencies within it.

The activities and criticisms of the last several years suggest that a search is being made for new models of teacher preparation. It is the conviction of those who have worked in this project that the approach herein suggested merits numerous tryouts to discover if, indeed, it does have some promise of meeting some of the deficiences of current programs and does suggest some new perspectives to a new and exciting future.

---

*Suggested by Jerry Mars.

FOOTNOTES

1. T. Keith Glennan, "Inventing an Education for Engineers," Saturday Review, November 20, 1965, p. 72.

EDITOR'S COMMENT ON MEDIA COMPETENCIES NEEDED BY TEACHERS IN 1966

The preceding chapters have developed generally a new and different design for teacher education as well as for the development of media competencies on the part of prospective teachers as well as those currently on the job. There are reasons to believe that the new look in teacher education will include some, if not many, of the elements which have been presented and discussed.

It seemed reasonable, however, to include a final chapter which took into account the fact that changes are likely to be gradual and that many teacher educators and media specialists need guidlines as to what competencies are needed now. The chapter which follows is an attempt to give guidance and direction to those who need such assistance now.

Chapter IX identifies three major competencies under the heading of conceptual and operational processes, theory and skills. It is suggested that these three areas may be thought of as the cognitive, the affective, and the psycho-motor domains. The ways in which different institutions decide to provide these competencies will vary. Some will move toward individual instruction, some will provide them by group experience, others will attempt to integrate and develop them with other professional experiences.

It should be recognized that one of the difficulties with developing specific competencies as the rapidity with which they become out-of-date and obsolescent. It is for this reason that the chapter heading is "Media Competencies Needed by Teachers in 1966." The various authors in the preceding chapters from which the competencies were drawn for Chapter IX attempted to look ahead but the speed with which new theory is being developed and the technology to implement the new theory suggests why it is difficult to much more than suggest what should be done at the present moment.

All of this discussion recommends a movement toward new models of teacher education where specifics in terms of competencies or courses are replaced by objectives which are always in a state of re-examination and change. The task to be performed suggests what understanding, attitudes and skills practitioners must have rather than starting with specifics for which there may be little if any empirical evidence for their mastery.

CHAPTER IX

MEDIA COMPETENCIES NEEDED BY TEACHERS IN 1966

Conceptual and Operational Processes (Cognitive)

I. To develop instructional objectives[1] in behavioral terms followed by specification and arrangement of instructional stimuli upon which the desired behavior is contingent.

II. To gain knowledge about and experience with media so that their respective characteristics might be known. Such knowledge should help the designer of the instructional sequence to make acceptable intuitive judgments as to which medium used alone or in combination with other media will most effectively and efficiently produce the desired behavior change. Where extant media are not available or where they do exist but require additional elaboration, experience in designing media in order to achieve the desired results should be provided.

III. To try out, analyze, critique, and modify a unit prepared and used with one or more learners possessing the psychological characteristics for which the unit was prepared.

IV. To have experience with instructional systems[2] involving man-machine relationships. Television is likely the best medium for most prospective teachers although programed instruction or learning laboratories might be more suitable for certain content areas.

---

[1] See Gerlach's description of "Instructional Specifications."

[2] See Heinich's description of "mediated teacher."

V. Actual experiences with the total range of instructional resources which are available in both substantive as well as professional areas of teacher education programs. The first-hand encounters with the media will enable each prospective teacher to judge the effectiveness of each medium.[3]

---

[3] See Torkelson's description of a new program of teacher education.

Theory (Affective)[4]

I. To understand the explosive growth of modern technology--particularly in communications and the storage and retrieval of information.

II. To be conversant with the impact of new technology upon education.

III. To understand the implications of learner-centered and response-oriented instruction.

IV. To have a thorough grounding in the psychology of learning, including orientation to various theoretical perspectives and corresponding lines of research in instructional techniques.

V. To understand the concepts of operations research and systems analysis as they have developed in the scientific study and management of military and industrial operations, and recently in experimental applications in education.

VI. To be acquainted with the various and conflicting strands of perception theory, and to have some grasp of the bearing of perception theory and research upon instructional procedures.

VII. To be acquainted with communication theory, its relationship to perception theory, and its use as a tool in the analysis of instructional problems.

---

[4] See Norberg's theoretical background required by teachers.

VIII. To be acquainted with the broad scope of instructional research as related to the use of media, and its prominent underlying theoretical perspectives, such as experimental developments in linear programing as related to reinforcement theory, or recent research in cognitive development testing and refining the theories of Piaget, Inhelder, Vygotski, etc.

IX. To understand and appreciate the limitations and conspicuous gaps in present instructional theory and research, such as the limited knowledge of the nature and functions of iconic signs.

Basic Conceptional and/or Operational Skills (Psycho-Motor)

Production of Audio-Visual Materials

I. Manipulative Skills:[5]

- A. Using the chalkboard
- B. Cartooning and simple sketching
- C. Mounting pictorial materials
- D. Lettering
- E. Making displays
- F. Duplicating printed materials
- G. Recording on tape
- H. Making transparencies.

Operation of Equipment

I. Ability to set up and operate this type of equipment:[6]

- A. 16mm projector
- B. 8mm silent and sound projector
- C. 35mm filmstrip & 2" x 2" Projector
- D. Overhead projector
- E. Opaque projector
- F. Record player
- G. Tape recorder
- H. T.V. receiver
- I. Photocopier

Optional Conceptional and/or Operational Skills (Psycho-Motor)

Production of Audio-Visual Materials

I. Production Skills:[5]

- A. Motion pictures (8mm silent and/or sound)
- B. Laminating pictorial materials
- C. Exhibits and models
- D. Recordings
- E. Radio
- F. Printed materials
- G. Masters and paste-ups

Operation of Equipment

I. Process to be Performed:[6]

- A. Still camera
- B. Movie camera
- C. Scripting for radio or TV
- D. Program writing, editing and evaluating
- E. Computer programming.

---

[5] See Kemp's discussion of each item in detail.

[6] See Curl's discussion for each item in detail.